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VIEWS, NEWS AND INTERVIEWS.

The following anonymous lines, taken from the title page of Volume V of the New York *Mechanics' Magazine*, 1835, will bear reprinting:

"What justly envied feelings warm the breast,
Of him whose ardent soul can find no rest
But in imparting wisdom's light serene,
And scattering science o'er life's dreary scene."

A New York restaurant keeper has succeeded in capturing a till-tapper by connecting up his money drawer with an electric bell placed in the restaurant keeper's sleeping room. When the bell rang the proprietor, in negligé attire, descended upon the midnight marauder and effected his capture.

It is reported in Berlin that Mr. Henry Villard is to return to Germany again for a protracted stay.

The judicial authorities of the German government, having investigated (?) the system of putting murderers to death by electricity, in vogue in New York, are preparing a report which is decidedly favorable to the adoption of the method in Germany as a substitute for beheading. It is assumed by the electrical experts and others that the recent executions at Sing Sing were highly successful, and they are all of the opinion that the many objections which have been raised against the gallows and the block are wholly removed by the electric system.

Mr. Rudyard Kipling, whose stories of Indian garrison life, have made him the latest literary fad, has had an attack of huffiness. It appears that an application was made to him by an American literary agent for a story, the scenes and characters of which should be essentially American. Mr. Kipling replied in vigorous English, declining the commission, at least until he had educated himself by means of typewriters, sewing machines and electric motors to turn out fiction by the lineal yard.

The Mayor and other members of the Board of Electrical Control were gratified by a recent statement from Expert Wheeler and Engineer Kearney, that 3,156 poles and 5,573 miles of overhead wires had been removed from the streets of the city between January 1 and June 30 of the present year.

One night last week our crack White Squadron engaged in manœuvres in the North River. The 23,000 candle-power search-lights played an important part and re-demonstrated their value as powerful factors in modern naval tactics. Lieutenant Rodgers was in charge of the electrical apparatus.

The Flushing & College Point, L. I., Electric Railway began business about four months ago with a board of 13 directors. Three directors are dead and the secretary of the company has run away. The passengers are all right at this writing.

Washington newspaper men are making strong objections to the new style of cross-hatched Western Union telegraph blanks.

To-day a man may want a motor breeze on the back of his neck, and to-morrow a wad of red flannel in the same place.

Electric Motors for Water Works.

Capt. Thomas W. Symons, United States Corps of Engineers, has been employed by the city of Spokane, Washington, as consulting engineer to devise a plant for a water works system for Spokane. Captain Symons has rendered his report, in which he considers a number of well worked out plans. In one of these plans it is suggested that the pumping station now in the city be taken advantage of to generate an electric current. From here circuits would be run to the springs on the outskirts of the city and used to drive the pumps with. In his report Captain Symons says:

"This last scheme of supplying power I regard as perfectly practicable, and as the city will require the present pumping station anyway for the high service and possible other uses, the expense would be limited to putting the necessary power wheels, dynamos, line and motors. The matter should be carefully studied, and the one of these schemes which appears to be the most economical and promises to give the best satisfaction should be adopted.

"The electric power scheme would permit the use of any of the springs, the Dart, Selheim, Newberry or Clark springs, and in this it has some advantage over the water-power scheme."

What Our English Brethren are Accomplishing.

Referring to the challenge of Mr. F. J. Sprague, our esteemed contemporary, the London *Electrical Review*, says:

What better proof can be necessary to the advantages of electricity as a motive power than the success, from an electrical point of view, of the City and South London Railway, with its 100 horse-power locomotives, capable of running 25 to 30 miles an hour. The newly designed Central London Railway, which has received the sanction of both Houses of Parliament, will have electric engines of 300 horse-power, capable of giving a high speed.

Americans have, then, several practical examples which will serve their purpose better than the proposed *experimental* track.

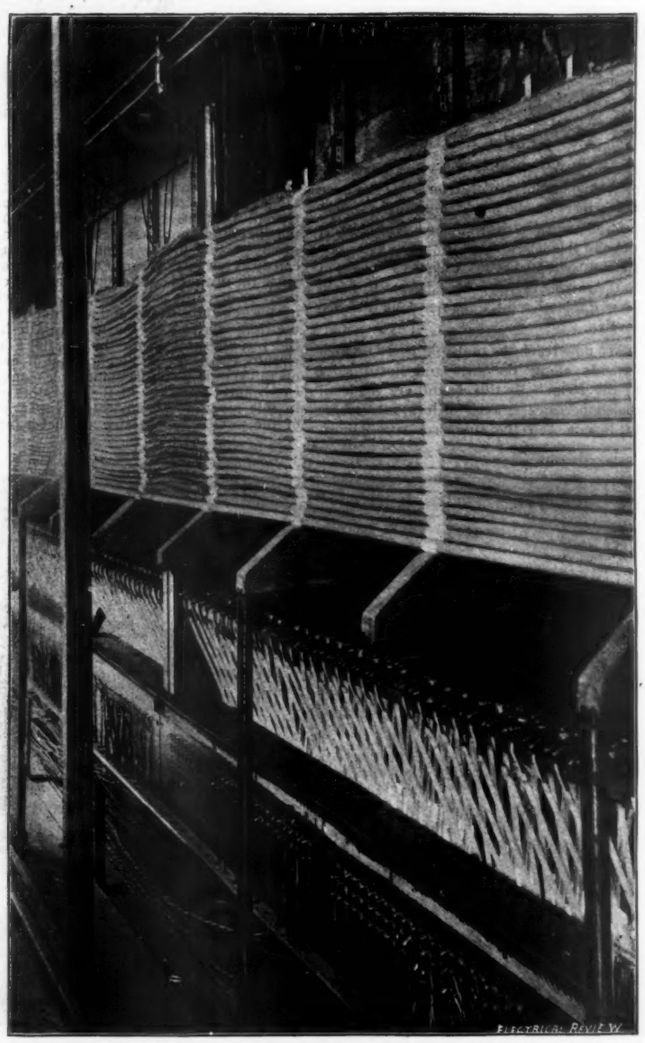


Fig. 1.—Boston's New Telephone Exchange.—Rear View of Multiple Switchboard.

BOSTON'S TELEPHONE EXCHANGE.

THE NEW CENTRAL OFFICE OF THE NEW ENGLAND TELEPHONE AND TELEGRAPH COMPANY.

During the past few years we have made frequent mention of important advances in the reorganization of the telephone service in various great cities throughout the country. Another signal example of this has now to be chronicled in the inauguration of a central office of the most modern type by the New England Telephone and Telegraph Company, at Boston. The policy of the large telephone companies is to establish their important exchanges in buildings designed especially for the accommodation of the complicated system of cables, connecting devices and apparatus which central telephone stations nowadays demand; this progressive policy is particularly marked in New York, where the Metropolitan Telephone Company now has three model telephone buildings, and Boston has just followed suit with a new office in which all modern advances in telephone engineering are embodied with the happiest and most substantial results. The opening of this office marks another important event in the radical reorganization of the telephone service which has been in progress for some time past throughout the United States.

It has been the general belief in telephone circles that the American Bell Telephone Company would erect in Boston for its own headquarters a building worthy of the great organization which takes such high rank among the industries of the country, providing accommodation in it for the local company, which is one of its most important licensees, thus accentuating the connection between the parent company and the actual work of providing the public with telephone communication. This enlightened policy of the Bell Company has borne fruit in the magnificent building at the corner of Milk and Oliver streets, Boston.

The new Boston telephone building is described as being one of the most substantial and well built structures in New England. It is nine full stories high, with an additional story at the top of smaller dimensions than those below. The materials used in construction are brown brick and Scotch brown sandstone, and so carefully has the whole arrangement been laid out, and so many precautions have been introduced, that it may be said that the building is absolutely fire-proof. The floors are laid with mosaic, and the dados in the corridors are of marble. The very door frames are not made of wood, but of adamant composition, which is moulded on the walls; and even if a fire should break out in any room, it would be practically impossible for it to spread to any other part of the building.

The sixth story of the building is occupied by the executive offices of the American Bell Telephone Company, including the treasury and the legal department. On the seventh floor are established the electrical and patent department, the archives, and the offices of the auditing and statistical departments. The New England Telephone Company has its general offices on the eighth floor, where the executive officers, treasurer, electrician engineer, auditor and secretary all find com-

fortable quarters. The two upper stories are entirely occupied by the operating plant of the telephone exchange. In the basement are placed the heating and ventilating apparatus, the electric lighting plant, the elevator machinery and the storerooms of the telephone company, and here we may fittingly begin to describe the technical equipment of this model electrical building, in which almost every possible application of electricity is utilized.

The lighting plant, which supplies the entire building with electric light, is a model of its kind. It consists of two Western Electric incandescent dynamos, having a joint capacity of 1,300 lamps, driven by two high speed Ide engines of 70 and 40 horse-power each. Two Whittier Machine Company's boilers of 55 horse-power each supply the engines with steam. A switchboard of the most improved pattern is placed in the dynamo room, from which all the lighting circuits in the building are controlled, and the usual outfit of ammeters and voltmeters is provided. Next to the dynamo room is the elevator machinery. There are five elevators, two for passengers, one for general freight, one for raising reels of cable and one for ashes and sweepings. They are worked by hydraulic machinery, provided with the well known Blake steam pumps. The elevators were all made by the Whittier Machine Company, of Boston.

We now come to the telephone plant proper. When the connections with the old office are all removed, the service will be carried on entirely through underground cables, as in New York. The subways which terminate in the cellar of the building, have a total capacity of about 150 ducts, each duct accommodating a cable of the regular type used for telephone work, containing upwards of 100 conductors. The cables are brought in through the cellar on iron racks, so that each cable is readily accessible, and carried to the cable shaft at the rear of the building. This cable shaft, which measures 5x10 feet, has a clear run of over 100 feet to the ninth story, where it emerges in the terminal room. Here the cables are headed up in the usual manner, the iron cable heads being arranged in two tiers on an upright framework, in such a manner that they are accessible both from the front and from the rear, which materially facilitates the work of making connections.

From the iron cable heads, the conductors are connected by bridle-wires to the Hayes combination protectors, which operate either with strong or "sneak" currents, thus effectively protecting the switchboard from damage by the inroads of foreign currents. From the protectors, flexible cables are extended under the flooring to the Hibbard distributing board. This distributing board, which so materially simplifies the complicated work of making cross connections between the terminals of the underground cables and those of the switchboard cables, has been described in former issues of the REVIEW, when dealing with the new exchanges of the Metropolitan Telephone Company, in all of which it has been introduced with marked success. The Boston distributing board is 15 feet 6 inches long; 2 feet 4 inches wide, and 9 feet high, and has an ultimate capacity of 6,400 metallic circuits. It is surrounded by a platform under which the cables from both sides are run. At present the board is wired from both ends, at one end extra territorial wires and at the other local subscribers' wires, the space in the middle being left for growth as the service increases.

Passing into the operating room, we find several different switchboards besides the large multiple board by which Boston subscribers are connected. At one end of the room is what is known as the test and combination loop board. The test board is wired for 1,020 telephone lines and 102 combination loops—special circuits with several stations each. The circuit manager in charge of the test board is provided with telephone and telegraph instruments, Wheatstone bridge and galvanometer, and all the necessary attachments and connections for making daily tests of the various lines, an operation which he performs every morning. Any trouble that is found is located as closely as possible by electrical tests, and orders are given to linemen and managers of outside offices to make the necessary repairs, according to the territory in which the trouble is found to be. The combination loop board, as its name implies, is for the purpose of inspecting and making connections between the circuits known as combination loops.

Next come the various switchboards at which the long distance and extra territorial trunk connections are handled. There is an intermediate switchboard, having a capacity of 150 metallic circuits for long distance subscribers and 90 local trunk lines for connecting extra territorial boards together. Beyond this board there are eight extra territorial switchboards, exclusively assigned to the service between the different towns in New England and the regular long distance service.

We now reach the multiple board, which extends along the east and north sides of the room. By this board are made all the connections between the local subscribers in Boston and the suburban trunk lines. The multiple board is of the Western Electric Company's most improved type, and is arranged for an ultimate capacity of 6,000 metallic circuit subscriber's lines and 600 metallic circuit trunk lines; at present it is wired for 3,600 subscriber's lines and 300 trunks.

The extra territorial trunking section is at one end of the multiple board. Four operators are employed in making these trunk connections; one connects the subscribers in the multiple board to the extra territorial boards, two make connections in the reverse direction, that is, from the extra territorial to the multiple board, and the fourth operator attends entirely to the suburban trunks. Next come three trunking sections where all the suburban trunk lines end. Each section has 100 trunk lines which are attended to by three operators, making 300 suburban trunks and nine operators; thus 13 operators are occupied solely in making trunk connections.

Following the trunking sections come 15 sections of the multiple board proper. Each section has annunciator drops and answering jacks for 240 subscribers, which are divided equally between three operators, 45 operators being the full force for working the present equipment of the multiple board. Our illustrations show, besides the plan of the operating floor, in which the position of every portion of the plant is clearly indicated, a view of the rear of the switchboard, with the mass of switchboard cables, connections of cords and plugs, etc., one wing of the multiple board and a corner of the multiple board, with the monitor's desk in the foreground. From the monitor's desk circuits are run to the telephone set of every operator, so that the assistant office manager can connect on to any of the operators and in this manner keep a constant supervision of the service, overhearing all that is being said by the operator and the subscriber.

The last part of the switching apparatus is the express board, which furnishes a service peculiar to Boston. It consists entirely of transmitting orders to the different express companies. There are 600 subscribers to this service, sufficient proof that the convenience and saving of time it affords are thoroughly appreciated. No connections are made, as the method of operation is reduced simply to the receiving and forwarding of messages. The board is divided into two parts. On one side the operators receive messages from the subscribers, the messages being written down on slips which are handed to the sending side of the board, where the operator sorts the slips and forward the messages by telephone to the different express companies. The express service is operated in exactly the same manner as in the old exchange.

The current required for working the various apparatus, such as transmitters, busy test and magneto bells, is obtained from a battery and generator plant situated on the tenth story. A primary battery of 300 gravity cells is placed here for the circuit managers' testing instruments and for operating the busy test. The operators' transmitters on the switchboards are all supplied with current, which, of course, during the daytime; is needed continuously, from a small accumulator plant consisting of four cells, which displaces 250 gravity cells. A small dynamo is provided specially for charging the accumulators, the dynamo being driven by a Perrett motor, which in turn is run by current from the regular electric lighting circuit of the building.

For ringing up subscribers there are 12 small alternate current generators which are run by an electric motor. The generators are connected to a switchboard by which the circuits they supply can be interchanged whenever necessary or desirable.

FIG. 2.—CORNER IN BOSTON TELEPHONE EXCHANGE, SHOWING SWITCHBOARD AND MONITOR'S DESK.

FIG. 3.—VIEW FROM CHIEF OPERATOR'S DESK—THE FULL LENGTH OF THE EXCHANGE.

It is interesting to note, in connection with this wonderful electrical building, where the science of the age does useful service in a dozen different ways, that the entire electrical plant was made and installed by one company, and the whole building, equipped as it is from cellar to roof with modern electrical appliances of the most perfect type, is a striking example of the wonderful resources of the Western Electric Company, the corporation we refer to. Not only did they supply the entire operating plant of the

(*Continued on page* 303.)

An Early Dynamo Machine.

An interesting chapter in the history of the development of the modern dynamo electric machine is to be found in William Sturgeon's "Scientific Researches," a folio containing 563 pages and 19 copper-plate engravings, printed in 1850 by Thomas Crompton, of Bury, and published by subscription. This interesting work contains a list of 251 subscribers, mostly Lancashire folk. Among the names of subscribers are to be noticed those of Michael Faraday and James Prescot Joule. In spite of the fact the work contains a vast amount of electrical research and speculation, Sturgeon evidently looks upon his spindle armature magneto machine with commutator for setting the currents in one direction (unio-directive discharger) as one of his most important inventions, and in the preface he thus refers to it (page vi):

"The magneto-electrical machine represented by Figs. 1 and 7,* Plate XII, has some years since found its way into the specification of a patent by Mr. Woolrich, of Birmingham, for the purpose of electro-gilding and silvering, notwithstanding my having published the same plan a long time previously, and pointed out its superiority over that in which voltaic batteries are used. The first announcement of my apparatus was in a paper read before the Royal Society, June 16, 1836, in which it was stated that I had coated metals from metallic solutions by means of the magnetic electrical apparatus; and in a small work on 'Electro-Gilding and Silvering,' published March 1, 1842, I particularly stated the application of the same machine in the process of gilding and silvering in the following words: 'It is now more than seven years since I contrived a magnetic electrical machine that produced continuous electrical currents, by means of which I coated metals with tin, copper, etc., and I have employed the same machine to great advantage in silvering, gilding and platinizing various kinds of metal of inferior value, and I have no doubt that in this capacity the magnetic electrical machine will become generally useful.'"

The paper read before the Royal Society (June 16, 1836) is reprinted on page 251, *et seq.*, of the work now under notice, and commences by pointing out the general advantages of magnetic machines over batteries. Next comes a description of the spindle armature machine, in which a longitudinal coil revolves between the arms of the magnet. Sturgeon also realized, what is generally looked upon as a quite modern discovery, that in this type of armature an iron core may be dispensed with.

Fig. 1 shows the machine with the near limb of the compound horseshoe magnets removed and the armature in section. The following is from Sturgeon's description: "The spindle *i i* passes through the pillar *f* (which supports the wheel *g*), and also through the axis of the reel *k k k k* to which it is fixed. On the reel is coiled 200 feet of copper wire, about one-twentieth inch in diameter, and covered with stout white sewing-silk to prevent metallic contact in the coil. The reel which holds the wire is made of two thin pieces of deal, of the shape *k k k k*, which forms the cheeks, and are kept at about one and one-quarter inch apart and parallel to each other by the pieces which cross them for the reception of the wire. The extremities of the wire terminate in a discharging arrangement to be described in the sequel." The magnet used was a four-bar horseshoe magnet weighing 23 pounds, the limbs being five inches apart at the poles and about six inches apart near the bend; hence will be seen the reason for the two long sides of the coil not being quite parallel. Fig. 2 represents the core of the armature in end view and shows the hole for the axis. Sturgeon continues: "When the magnet is placed on the stage its plane is parallel to the plane of the base board. The spindle *i i*, which is also parallel to the axis of the base board, is situated in the axis of the magnet. By this arrangement the coil is made to revolve between the branches of the magnet, and electric currents are excited whilst the coil travels through the magnetic lines." Sturgeon now refers to Fig. 5 as representing the wire circuit and Fig. 3 as representing the magnetic field, and at some length traces out the phases of current production, much in the same words as may be met with in a text-book of the present day. He then describes a number of experiments with the machine, and afterwards he alludes to a machine with a horseshoe armature and also the one direction commutator. The structure of the one direction commutator will be sufficiently obvious from the sketches, small hollows containing mercury fulfilling the functions of the ordinary brushes, and as these obviously have to be horizontal, the commutator must be made double, as shown by Fig. 6, segments *c* and *d* being connected with one end of the wire, while segments *a* and d^1 are connected with the other end. Sturgeon, however, evidently did not confine himself to the commutator with mercurial brushes, as in an appendix (page 275) to the memoir he refers very emphatically to the inconvenience of using mercury, and advocates the use of "discharging pieces or springs, lubricated by sweet oil whilst pressing upon the metallic arcs attached to the revolving spindle," and he says this contrivance was first described by him in the *London and Edinburgh Philosophical Magazine* for September, 1835. In another appendix (page 274) he says, "Mr. Christie, one of the Council of the Royal Society, saw some of these experiments with the spring discharger attached to the machine at my house within a week after my paper was read. At that time the machine would liberate one cubic inch of gas from acidulated water in eight minutes, showing an increase of power equal to one-third of that which is exerted with the mercurial polar cells."

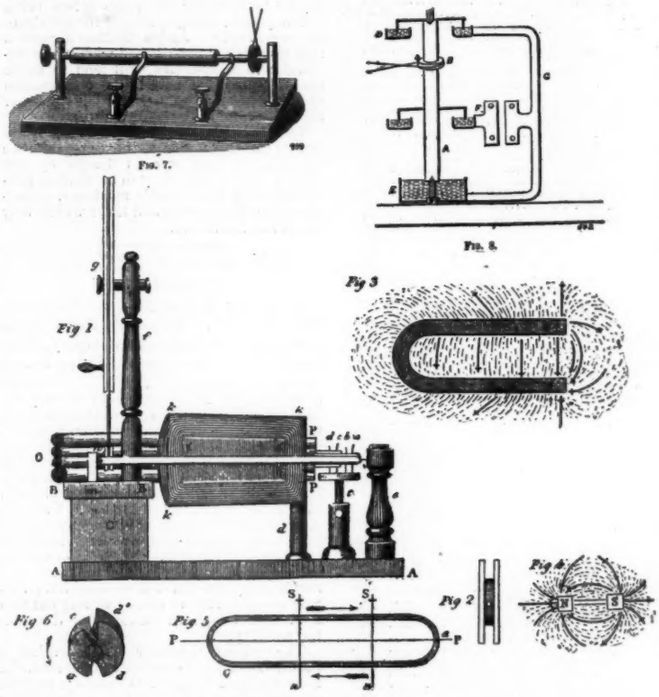
Sturgeon's collected account of his researches presents many other points of interest, especially in relation to numerous rotation experiments, both with thermo-currents and battery currents, several of these touching on matters which have scarcely found place in modern text-books; and some of the most interesting relate to the rotation of a magnet about its axis when the magnet itself carries the actuating current, an arrangement which gives us the simplest electric motor or dynamo known; armature and field being one. Such an arrangement is referred to (as generator) in Mrs. Mary Somerville's "Connection of the Physical Sciences," second edition, London, 1835, page 361, who says, "When a magnet revolves uniformly about its own axis, electricity of the same kind is collected at its poles, and the opposite electricity at its equator." The experimental proof of this is quite easy, if a round bar of magnetized steel is carefully centered on a quick running lathe and light tin-foil brushes are used. It is worth mentioning that one modern book at least deals with this simple form of dynamo, as in Prof. Oliver Lodge's "Modern Views of Electricity," Macmillan, 1889, page 146, we have a drawing of the dynamo in question, see Fig. 7.

In reference to the dynamo represented above, Professor Lodge says: "Spinning the magnet mechanically gives a current between two springs, one touching it near or beyond either end, the other touching it near the middle."

Such a dynamo as that mentioned by Mrs. Mary Somerville and by Dr. Lodge gives, as might be expected, a low potential, but an apparatus of very small size will give sufficient tension for the deposition of copper, and it would not surprise us if a slight modification of this form should prove specially suitable for such purposes as welding, where a large current of low tension is needed. In such a case the resistance at the brushes would probably have to be reduced by such a device as setting the magnet vertically and making the circuit through mercury cups; the top or middle cup being, of course, annular, and having the bottom end of a vertical conducting cylinder dipping in it.

The sketch Fig. 8 will serve to indicate a possible arrangement.

It is sufficiently obvious that electro-magnets can be used instead of permanent magnets in such a case as this; and that the self-exciting principle is applicable.—*London Engineering.*



AN EARLY DYNAMO MACHINE.

* Fig. 1 has a spindle armature and Fig. 7 has a horseshoe armature; each having the one direction commutator.

PERSONAL.

Mr. Chas. Desmond, of *The Weekly Stationary Engineer*, Chicago, called at the REVIEW office last week.

Mr. O. D. Pierce, of O. D. Pierce & Company, electrical contractors and agents in Philadelphia for the Perkins incandescent lamp, was a visitor in the metropolis last week.

Charles J. Van Depoele, of the Thomson-Houston Company's works, has started on a grand circuit, which includes New Orleans, Chicago and Washington. His object is to do work on his interference cases, in connection with his 50 or more electric railway patents.

Pomona, Cal.—San Antonio Light & Power Company; capital, $240,000.

Aiken, S. C.—The Carolina Light & Power Company; capital, $20,000.

San Francisco, Cal.—Berkeley & Lorin Water & Light Company; capital, $250,000.

Fort Wayne, Ind.—The Fort Wayne District Telegraph Company; capital, $20,000.

Chicago, Ill.—The Wisconsin Gas Company, to construct and operate gas and electric plants; capital, $2,000,000.

Washington, D. C.—The Carpenter Electric Light & Motor Company, of the District of Columbia; incorporated in West Virginia; capital, $100,000.

Chicago, Ill.—International Electric Railway Company; to manufacture street railway appliances: capital, $2,500,000; incorporators, D. L. Coe, M. M. Wood and D. L. Coe.

South McAllister, Ind. Ter.—The Choctaw Construction Company, to construct railroads, telephone and telegraph lines; incorporated in West Virginia; capital, $1,000,000.

Chicago, Ill.—Chicago and Evanston Electric Railway Company; capital, $500,000. Incorporators, John L. Cochran, DeLancey H. Louderbeck, Frank S. Gorton and Alexander Clark.

Chicago, Ill.—Harrison Street and Desplaines River Electric Railroad Company; capital, $112,500. The incorporators and first board of directors are E. L. Steward, S. G. Swisher, G. Grant Stewart, W. B. Phister and H. H. Ingham, all of Chicago.

Electricity vs. The Horse.

The June figures of the operation of the West End Street Railway Company have just been compiled by the auditor. We publish them in practically the same form as those given for April and May, condensing the details per mile, and giving more clearly the actual cost of maintenance and motive power:

JUNE STATEMENT.

	Total.	Electric.	Horse.
Gross Receipts	$549,548	$153,988	$395,555
General expenses	29,688	7,465	22,217
Maintenance expenses	26,638	8,078	18,559
Transporta'n expenses	135,292	31,555	106,836
Motive pow'r expenses	142,570	26,359	116,210
Total operat'g expenses	337,284	73,459	263,825
Net earnings	212,259	80,590	131,729
Miles run	1,433,785	360,567	1,073,218
Ratio mileage	100	25.15	74.85
Ratio of net earnings	100	37.94	62.06
Per cent. operating expenses	61.37	47.70	66.70
Earnings per mile run	38.33	42.71	36.85
Expenses per mile run:			
Motive power	09.94	07.31	10.83
Other expenses	13.58	13.06	13.75
Total ex. per mile run	23.52	20.37	24.58
Net earn'gs per mile run	14.81	22.34	12.27

The long electric cars operated by the same-sized Thomson-Houston motor as the ordinary-sized car show gross returns of 45 cents per car mile operated in June.

While last Winter only about 40 long electric cars were in operation, there will probably be from 300 to 400 cars of this new type operated this winter.

By January 1 one-half the earning capacity of the entire street railway system will be equipped with the Thomson-Houston electric system.

In June the motive power cost $7,300 less than in May, the electric cars were operated at less than 50 per cent. for expenses, against 58 per cent. in May, and the total expenses per car mile were reduced from 22.36 cents to 20.37 cents, while the cost per mile of operating the horse car lines remained substantially the same as in May.

President Whitney says: "Net earnings of 22.34 cents per electric car mile operated, against 12.27 cents per mile of horse car line operated, tell a true story."—*Boston News Bureau.*

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After the injunction—the stay. After the stay—what?

Mr. Charles F. Brush, of Cleveland, Ohio, is our legal victor this week.

This has been the liveliest season for a dull one we have ever experienced.

The Electric Light Convention begins in Montreal, September 7. Keep this in mind.

More legal news for our readers this week. These are hot days to delve in legal lore, but it's all interesting and valuable.

The word to express execution by electricity is again being discussed by the press. We think the suggestion of the New York *Sun* the best. It gives "hanging" as the most suitable.

We challenge any industry to show the expensive improvements constantly being made in the telephone branch of electrical work. And yet this wonderful instrument, with its progressive promoters, receives unmeasurable abuse from the press and public. If the party "who struck Billy Patterson" ever turns up, perhaps he can tell why.

A STAY IN THE INCANDESCENT LAMP SUIT.

Judge Wallace has ordered a suspension of the injunction in the lamp case pending an appeal. This will leave the commercial features of the lamp industry substantially in *statu quo*. The value of the decision in favor of the plaintiff will be the influence it may exert on the Appellate Court. The reasons influencing the order were the delay the plaintiff had made in bringing its suit and the doubtful character of the patent on its face which invited competition and led to the investment of a great amount of capital. If the injunction were permitted to go into immediate effect the public would be affected by the necessary interruption of many existing lighting plants, and a great number of men would be thrown out of employment. He thought the suspension of the injunction for six months was not unreasonable, in view of a delay of five years in bringing suit. The operation of this order will be of great present value to the defendant company. Much might be said for or against the order. The court having once declared the patent sound and that infringement existed, it would seem that the consequences of the infringement should be borne irrespective of any embarrassment that might ensue. On the other hand, where a clouded title led people, who acted under the best light they could get on the patent, to invest large amounts of capital, and where they were permitted to build up a large business for five years before being called to task, strong grounds for indulgent treatment exist. Judge Wallace's remark that there is a "fair doubt" whether his decision will be sustained, will tend to mask the effect it would have in the construction of the Appellate Court, and adds another element of doubt to the ultimate issue.

The order for the stay suspends the operation of the injunction so far as regards the manufacture and sale of lamps by the United States Company to be used in connection with the dynamo machines, including those already sold and those which may be sold in the future.

THE MODERN TELEPHONE EXCHANGE.

On another page we publish a description of the new central office of the New England Telephone and Telegraph Company, lately established in the superb building erected by the American Bell Telephone Company in Boston. It is the fashion of the day for wealthy and powerful corporations to make their headquarters in enormous buildings of their own property, and these modern palaces of industry serve as fitting monuments to the enterprise and power of the corporations which take such prominent place in the history of this industrial age. That the American Bell Telephone Company should follow this fashion on such a grand scale, is an event of interest to all those interested in the electrical industries, and the interest is increased by the fact that the splendid structure is not merely an office building but also a modern telephone building of the most improved type.

The parent company has provided a model home for its energetic offspring, the New England Telephone Company, and the telephone man will revel in our description of subways, cable shaft, distributing boards and switchboards—switchboards there are in almost bewildering number, but all arranged methodically and systematically. The entire plant is of the most perfect description, and several new features have been introduced. One most interesting innovation is the working of the operators' transmitters by storage batteries. The accumulators are charged by a small dynamo, which is driven by a motor supplied with current from the electric light circuit of the building. It is curious to trace the transformations of energy which take place here. First the mechanical energy of the engine is transformed into electrical energy by the dynamo, and the motor then reverses the process for a further transformation into electrical energy by the small dynamo. In the accumulator cells the electrical energy is turned into chemical energy and again into electrical energy when the cells are discharged. In the transmitter the electrical energy changes its character but not its form, as it were, and in the receiver at the far end of the line it returns to mechanical energy in the movements of the diaphragm.

To return to the telephone building we would only draw special attention to one point, since all are so fully described. This is the fact that the entire electrical equipment of the building, from dynamo to elevator annunciators, was supplied and installed by the same corporation. Few other of the great industries of the world could show such a variety and magnitude of resource as the Western Electric Company has given proof of here, and the immense strides of electrical progress during recent years are strongly in evidence when such development is chronicled.

IN FAVOR OF BRUSH.

THE STORAGE BATTERY SUIT OF THE BRUSH ELECTRIC COMPANY *vs.* THE ELECTRICAL ACCUMULATOR COMPANY DECIDED IN FAVOR OF THE FORMER.

We publish in full the opinion of Judge Coxe, of the U. S. Circuit Court, in the storage battery suit, which was given out last week:

Circuit Court of the United States, Southern District of New York.—The Brush Electric Company *vs.* The Electrical Accumulator Company, *et al.*—W. C. Witter and W. H. Kenyon for the complainant, Frederick H. Betts for the defendants.

Coxe, J.

This is an equity action founded upon three letters patent, granted to Charles F. Brush for improvements in secondary batteries, as follows: No. 337,299, granted March 2, 1886, No. 260,654, granted July 4, 1882, and No. 266,090, granted October 17, 1882.

These patents and one other, No. 337,298, granted March 2, 1886, were before this court in Brush Company *vs.* Julien Company, 41 Fed. Rep. 679. The court there decided that No. 337,298 and No. 337,299 were for the same invention and intimated, as the inventor and his expert apparently regarded the former as the broader patent, that the difficulty might be met by a surrender of the latter or by a disclaimer of similar claims therein. This solution of the difficulty was thrown out as a suggestion merely, the final disposition of the patents being left till the settlement of the decree.

It was not the intention of the court to decide that one of these patents was entitled to preference over the other. For the reason stated and for convenience of illustrating No. 337,298 was given prominence in the discussion, but the conclusion would have been the same had the position of the patents been reversed.

Upon the settlement of the decree the complaint selected No. 337,299 as the patent upon which it chose to reply, and withdrew No. 337,298 from the consideration of the court. This was done without objection by the defendant in that case.

On the 15th of July, 1890, after the decree in the *Brush-Julien* case was entered, the complainant withdrew No. 337,298 from this cause, and an order was entered dismissing the bill as to that patent. The cause has since proceeded upon the three patents as stated.

In the prior litigations involving the subject matter of these patents the following propositions have been decided:

First. That Mr. Brush was the first in this country to hold absorptive substance, in the form of dry powder, in place on the supports of a secondary battery by paper or equivalent material, and the first who rammed or pressed it into grooves or receptacles in the plates.

Second. That No. 337,298 and No. 337,299 are for the same invention, and that the complainant was not entitled to both patents, but was entitled to one.

Third. The complainant having elected to hold No. 337,299, it was decided by the decree that claims numbers one, two, three, six, seven, eleven, twelve and thirteen were valid, the word "perforations" in claims numbers six and seven being construed as synonomous with "cells or cavities."

Fourth. That the claim of No. 260,654 was not infringed by the application of the absorptive substance to the grids by a trowel or spatula.

Fifth. That the defendants, by the use of supports filled with rows of uniform square holes, did not infringe the "rib claims" of No. 266,090.

Sixth. That claims numbers seven and fourteen of No. 266,090, the latter claim being limited to the "perforations" described, were valid and infringed.

Seventh. That No. 337,298 (and by implication No. 337,299) was not invalidated by patents Nos. 261,512 and 261,995 granted to Mr. Brush, July 18, and August 1, 1882, respectively.

Eighth. That No. 337,298 (and by implication No. 337,299) was not invalidated by the expiration of the Brush Italian patent.

(*Brush vs. Julien*, 41 *Fed. Rep.*, 679; *Accumulator vs. Julien*, 38 *Fed. Rep.*, 126.)

All of these conclusions were reached after careful study and mature deliberation, and now, after having been re-examined in the light of the present record, arguments and briefs, except as to claims Nos. 11 and 13 of No. 337,299, are re-affirmed. No useful purpose would be subserved by again discussing them, as such a task would only involve a repetition of what has been said already in the other cases.

The proof of infringement is substantially the same as in the *Brush-Julien* case. It is more complete as to the manner in which the active material is applied to the plates, but in this respect it only emphasizes the former decision as to the non-infringement of the claim of No. 260,654. The claim is as follows:

"The method of forming the plates of a secondary battery consisting in forming receptacles for oxide of lead in its surface, then applying oxide of lead to the plate and within such receptacles and afterwards subjecting the oxide of lead to pressure."

The claim clearly contemplates not only the treatment adopted by the defendants, but *afterwards* subjecting the oxide to pressure. The defendants apply the oxide to the plates and within the receptacles with a wooden trowel in the hands of the workmen, and there they stop. They do not subject the oxide to pressure afterwards.

The questions arising upon the expiration of the Italian patent and as to the validity of the "red lead claim" are, however, presented by this record in a new and different aspect and may, with entire propriety, be examined *de novo*, together with the question, not heretofore considered, relating to the effect of Brush patents Nos. 260,653 and 276,155 upon the broad patent in suit.

First. It is thought that claims Nos. 11 and 13 of No. 337,299—the red lead claims—are void for lack of invention. The specification, after referring to lead-oxide as the active material, which is primarily and mechanically applied to the plates, proceeds:

"Per-oxide is the best oxide of lead to use in the preparation of the plates; but as this is rather expensive to prepare, red lead or minium may be used."

If the record contained nothing but this statement, the claims could not be upheld. After the invention of a support primarily coated with mechanically applied oxide of lead, merely coating the plate with the commonest, cheapest and best known form of lead-oxide, did not require the exercise of the inventive faculties. Especially is this so when the patentee himself asserts that the best results can be obtained by using per-oxide. It would seem that the use of red lead would at once occur to any one who had even a superficial knowledge of the art. There is no more novelty in using red lead for the coating, than there is in using cast lead for the plates. (*Brush vs. Julien, supra*, p. 692.)

The following paragraph, taken from defendants' brief, states with clearness and precision the views of the court upon this subject:

"The specification says that red lead is inferior to the per-oxide, and we submit that no valid claim can be founded upon the use of an inferior article when it is shown that the use of the superior article is old."

Patent No. 337,299, at least so far as its broad claims are concerned, is not invalidated by anything contained in the Brush patents No. 260,653 and No. 276,155. The application for the former (No. 260,653) was filed June 15, 1882, two days after the application of No. 337,299.

No one can read the specification of No. 260,653, without being impressed with the fact that the inventor intended to confine the patent to a single point, namely, the form of the electrodes. He expressly says so.

"This application is a division of my application designated as 'Case I' (337,298-9), filed July 13, 1881, in which other features of my invention are claimed. For convenience in distinguishing this invention among others of mine in the class of secondary batteries, I have denominated it 'Case I, Division A.'"

Again he says:

"My invention consists essentially in a secondary battery element, consisting of a structure of etagere-like form, containing in the spaces between its shelves, lead in a finely divided state."

The claim is:

In a secondary battery, an element consisting of a structure of etagere-like form, containing in the spaces between its shelves, lead in a finely divided state, substantially as set forth."

It is true that the broad invention is described, but it is equally true that it is not claimed. It was hardly possible for the patentee to describe the subsidiary invention without disclosing his main invention. Having disclosed it, had he permitted the patent to issue without warning or reservation, and after the broad invention became public property, had filed an application covering what he had thus relinquished to others, it is probable that he would have been informed either in the patent office or in the courts that his application came too late. But that is not this case. Before his application for the subordinate invention, he had applied for the superior one. In the former, he expressly waived the right to use the broad invention. An infringer with the statements on the face of No. 260,653 before him, would scarcely have the hardihood to assert that he supposed the broad invention was released. No court would listen to such a plea. The claims of that patent did not protect Mr. Brush in the use of the broad invention. A person who did not use an "etagere-shaped" plate, could, if no other patent prevented, use the broad invention with perfect impunity. No. 337,299 was intended to prevent such use.

The court has not been able to discover an authority holding a broad patent invalid in such circumstances. None has been cited by counsel.

What is true of No. 260,653 is also true of No. 276,155.

Mr. Brush was the first in this country to make the broad invention as stated above. He is entitled to the fruits of his invention. It is the policy of the law to reward him.

When the court can see that a patentee has produced an invention of real merit it should not be unduly industrious in endeavoring to discover some statement or act of his by which, on technical grounds, his rights may be forfeited. It should rather be sedulous to protect him.

Whether or not the improvements patented by Nos. 260,653 and 276,155 are the same as the improvements covered by some of the claims of Nos. 337,299 and 266,090 it is, perhaps, unnecessary to decide, for none of the claims in issue and infringed are so affected.

It seems that in his anxiety to claim his invention in every conceivable form, the patentee has involved himself in a labyrinth of descriptions and claims in which electrician and lawyer alike are quite apt to become confused.

What Mr. Brush accomplished in 1879 and 1880, can be embraced in a brief, clear and concise statement. What he actually did at the present time his patents must be judged. He is entitled to what he invented, and only this. His patents can receive no broader construction because he described his inventions with irksome prolixity and gives to the same structure a wearisome variety of names. The nomenclaturist should not seek the reward for his labors in the patent office. A person is not entitled to a patent because he has invented a new word. The danger and impropriety of holding a number of claims relating to the same structure, and which can be differentiated only by the most abstruse and metaphysical distinctions, seems apparent. They are calculated to embarrass the inventor and mislead the public.

Did patents Nos. 337,299 and 266,090 expire with the Italian patent?

The Italian patent was applied for July 28, 1882, sealed August 8, 1882, and was issued for a term of three years from September 30, 1882. It expired September 30, 1885, never having been prolonged, renewed or extended. No. 337,299 was granted March 2, 1886; No. 266,090, October 17, 1882; both were applied for in June, 1881.

Having stipulated that the patent was issued for an unextended term from September 30, 1882, and that the translation appearing in the record is a correct one, this complainant is not in a position to argue that the patent was either extended as to time or limited as to its terms. Especially is this so in the absence of the Italian patent law, which is not in evidence, and of all proof tending to establish either extension or limitation.

The difficulty with the complainant's argument in this regard is two-fold, there is no law, and, second, there are no facts upon which to base it.

Section 4,887 of the Revised Statutes, is as follows:

"No person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been first patented or caused to be patented in a foreign country, unless the same has been introduced into public use in the United States for more than two years prior to the application. But every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than 17 years."

Under this section the test of identity between the foreign and the domestic patent, as established by the Supreme Court in two recent decisions, may be stated as follows:

In the principal invention in each, is the thing patented abroad the same in all essential particulars as the thing patented here, would the home patent be infringed by a structure made in accordance with the provisions of the foreign patent?

In cases where these questions are answered in the affirmative the United States patent fails, and it will not be saved by the fact that it contains improvements not found in the foreign patents.

Siemens vs. Sellers, 123 *U. S.* 276; *Com. Co. v. Fairbanks Co.* 135 *U. S.* 176.

Whether the expiration of a foreign patent for an improvement only will operate to overthrow a domestic patent for a broad invention which contains also a claim covering the improvement, has not apparently been decided by the Supreme Court. The language of the court in *Siemens vs. Sellers, supra*, is, perhaps, comprehensive enough to cover such a contingency, but this is a question which need not now be considered.

In the *Brush-Julien* case the court commented upon the absence of expert testimony relating to the Italian patent. No similar observation can, with propriety, be made regarding the present record. It would indicate a lamentable want of appreciation on the part of the court to ask for additional instruction and advice. Eight experts of greater or less prominence and attainments have testified upon this subject. Three of these, called by the defendants, have expressed the opinion that the divisions of the Italian patent described everything claimed in the United States patents granted to Mr. Brush and that the inventions covered by the two patents, No. 337,299 and No. 266,090, are literally described and substantially claimed in the Italian patent.

On the other hand, five electricians, including the patentee himself, have testified that the Italian patent relates to inventions wholly different and proceeds upon totally dissimilar lines. In short, that it is but a progressive step in the Plante method, its object being to aid the process of electrical disintegration of the plates in the electrolyte and not to supersede that process by placing the active material mechanically upon the plates prior to immersion in the battery fluid.

The mere fact that these gentlemen of conceded ability and learning, whose motive is to enlighten the court, and who were all sworn to tell the truth, differ so radically regarding the meaning of the Italian patent, is of itself suggestive.

The defendants plead the defense of forfeiture. They must prove it by a preponderance of evidence. And yet upon the question of the indentity of the patents and inventions there is a sharp difference of opinion among those who are most entitled to speak upon the subject. Is there not room for the assertion that the defendants have failed to sustain the burden in this behalf?

When this question was presented in the *Brush-Julien* case, the mind of the court was in doubt, and now, having re-read the Italian patent in the light of the new testimony, it is still in doubt, but inclining more strongly to the opinion that the complainant's contention is correct. The court is not prepared to hold, therefore, that the Italian patent is for the same inventions as those covered by the two patents in question.

The principal reasons which lead the court to adopt this view may be epitomized as follows:

First. The language of the Italian patent is entirely different from that of the patents in suit. The drawings are different.

Some of the divisions of the Italian patent are unquestionably dissimilar and some concededly relate to the Plante process. The broad statement relating to the primary coating of the supports with active materials, is not found in the Italian patent.

Second. The inventor's statement of his intent and purpose in taking the foreign patent and his reasons for not attempting to patent the invention of No. 337,299 abroad.

This testimony is corroborated by his notes made at the time he was perfecting the inventions patented abroad. When these notes are placed side by side with corresponding portions of the Italian patent it will be seen that they are substantially similar. Mr. Brush testifies that the portion quoted describes the invention of Division D of the Italian patent:

Brush's notes, Mch. 7, '82.

"About three weeks ago I conceived the idea of preparing secondary battery plates by compressing partially oxidized precipitated metallic lead, in the form of a fine powder, with great pressure, whereby I expect to get a solid metallic plate, coherent and malleable. * * * Now, by using very finely granulated or precipitated lead, and slightly oxidizing superficially each particle, spontaneously * * * by exposure to the air, or otherwise, and then compressing the metal, I will get a lead plate having minute seams throughout its substance filled with oxide of lead. This will very greatly facilitate the oxidation of the plate in the process of 'forming' in the battery. It will probably be found advantageous to coat a sheet of ordinary rolled lead on one or both sides with this peculiar fissured metal so that the rapid oxidation in the battery will be arrested by the rolled metal when the prepared metal is all oxidized."

Division D, Italian Pat.

"In this division I shall treat a secondary battery element, wherein, before treatment by a 'forming' process, either the entire body thereof, or only the coating or covering of a suitable core or body consists of a mass composed of metallic lead and lead-oxide, in an intimately mixed condition, pressed or united together into a compact and firmly coherent mass.

"In constructing this mass I take metallic lead in a pulverized, granulated precipitated, or other finely-divided state, and allow the surface of the lead particles to become oxidized, either by exposure to the air, or by any suitable artificial oxidizing process or application. * * * I now subject the mixture to heavy pressure, hydraulic or otherwise, whereby its particles are united and consolidated into a compact and firmly coherent mass. The mass thus formed consists of metallic lead, having minute veins of oxide of lead everywhere ramifying and extending through it; and these veins of lead-oxide within and throughout the mass greatly facilitate the penetration of the electrical action in 'forming' the plates for operative use in secondary batteries."

The notes of March 2, 1882, seem to describe the invention of Division D; they certainly do not describe the invention of No. 337,299.

Third. United States patents, other than those in question, were issued to Mr. Brush for the divisions of the Italian patent, evidently including Division D. At that time, therefore, neither the inventor nor the patent office officials thought these inventions, or any of them, were the same as No. 337,299. Furthermore, the attention of the officials was particularly called to the foreign patents.

The opinion of the United States officials seems to have been entertained also by those of Italy, France and England.

Faure's invention was well-known abroad and yet the patents issued to Brush with no objection apparently, from any source that they interfered with Faure.

Fourth. The fact that a sharp distinction is drawn in No. 337,299 between the inventor's and Plante's method. Mr. Brush claims his secondary battery element "as contra distinguished from a plate or element having the actual material produced by the disintegrating action of electricity as in the well-known Plante process."

There is nothing of this in the Italian patent. On the other hand the inventor clearly intimates that the plates of Division D are to be formed by the Plante process.

Fifth. The vast superiority of the electrodes of the United States patents in question over those made in accordance with the directions of the Italian patent, as demonstrated by the experiments of the complainant's experts.

A careful reading of Division D in the light of the testimony has convinced the court that some, at least, of these experimental plates are made in conformity with the formula of that division. None of them are like the plates of No. 337,299.

Sixth. The Italian patent is capable of a narrow construction, which differentiates it from the patents in suit.

When to the statements of the patent itself is added the testimony of the inventor that he intended to limit the patent in all its branches to a coating formed by the action of the electric current, and that he did not intend it to cover a coating placed on the plates mechanically before they are subjected to electrical action, there seems to be every reason why the narrower construction should be adopted.

Seventh. The fact that the element of the Italian patent is produced by heavy pressure, hydraulic or otherwise, whereby the particles of lead and lead-oxide are compacted into a firmly coherent mass having minute veins of oxide of lead everywhere ramifying through it.

There is nothing resembling this in the United States patents in suit.

Eighth. The "mass" described in the Italian patent is malleable and capable of being made into strips or wires, and manipulated so as to form any style of element.

Neither the active material of No. 337,299 nor the completed plate of that patent is capable of such treatment.

Ninth. No. 337,299 is designed to cover Mr. Brush's inventions made in the Summer of 1879 and in the Summer and Autumn of 1880.

(*Brush vs. Julien*, *supra*, 687; *Accumulator vs. Julien*, *supra*, 129-131).

Bearing this in mind it is quite clear that the discoveries of these years alone are insufficient to support the Italian patent. Something more is required. What Mr. Brush did in 1879 and 1880 is not described in the Italian patent. What he did in 1882 is described there.

The foregoing are some of the reasons which have induced the court to overrule the defense of forfeiture; in fact, the more the Italian patent is studied the more settled becomes the conviction that it is not for the same invention as No. 337,299.

Apply the test suggested in *Commercial Manufacturing Company vs. Fairbanks Company*, 135 *U. S.*, 176, 194. If a person in this country, after the issue of No. 337,299, were to commence the manufacture of secondary batteries by the precise processes described in the Italian patent, would the courts refuse an injunction to restrain their use on the ground that they do not infringe the claims of the United States patents?

It is thought, upon the conflicting testimony here presented, an intelligent court would feel compelled to deny an injunction, on the ground that infringement was not proved, or, at least, that the question was involved in such uncertainty and doubt as to justify the court in withholding the writ.

It may as well be admitted that this defense does not appeal strongly to the conscience of a court of equity. The statute creates it and in all cases where the facts are clear the statutes must be implicitly followed. But no one can examine the course of judicial decision upon the subject without being impressed with the fact that the courts have sought to construe it liberally, and have seldom, except in the plainest cases, permitted it to defeat a valuable patent.

Believing that Mr. Brush is entitled under our law to protection for a meritorious invention, the court should not, unless fully convinced that the facts warrant such a course, destroy his patents upon grounds which do not go to the merits of the invention, and which, for want of a more accurate word, may be termed *technical*.

Why a meritorious inventor, who is a citizen of this republic, should lose his rights at home, because he has tried to protect them abroad, is, on principle, not easy to comprehend.

It is said the expiration of the Italian patent threw the invention into the public domain. So it did, into the domain of the Italian public, but if Mr. Brush had taken no patent in Italy, the Italian public could have practiced the invention from the moment it became known there. Had he taken no foreign patents, his invention would have been thrown into the public domain of every land but this. In this country his inventions would have been protected for 17 years; outside of this country they could have been used with perfect impunity. The inventor applied for his patent here long before he applied abroad, but through the delay of the patent office, the foreign patents were issued first.

Assuming the inventions to be similar, the inventor has been guilty of no fault, the American public have lost no rights, and yet under the provisions of this statute, which it is thought was never intended to apply to a case like this, a valuable monopoly is destroyed.

These observations are, perhaps, only germane to the present inquiry as they tend to emphasize the suggestion already made that in dealing with a defense where, as in this case, the disaster following the inventor's act is so out of proportion with the fault, if fault it be, the court should proceed with the utmost caution, and, where the evidence is not clear, give to the inventor the benefit of the doubt. If convinced that he did not intend to patent the invention abroad, the court should not by construction broaden the language of the foreign patent, so as to destroy the domestic patent when that language is capable of a construction which permits the domestic patent to live.

The question of how to dispose of No. 337,298 is, in view of the complainant's position regarding it, more puzzling than ever. The rule which obtains in this circuit requiring a disclaimer of invalid claims as a condition of a decree has always seemed an arbitrary one. It certainly seems inequitable that the court, at *nisi prius*, should compel the patentee to renounce forever a claim which may be held valid upon appeal. It is possible that this rule may be modified by the Circuit Court of Appeals.

In view of this contingency and of the extraordinary and distinguishing circumstances surrounding this case the court has concluded, if the complainant upon reflection still desires to assume the responsibility of retaining two patents for the same invention, not to require a surrender or disclaimer of No. 337,298 as a condition of a decree. It is thought, however, that pending an appeal it should be deposited with the clerk to await the further order of the court.

An accounting having been waived, it follows that, on filing a disclaimer of claims 11 and 13 of patent No. 337,299, the complainant is entitled to a decree upon claims 1, 2, 3, 6, 7 and 12 of this patent, and upon claims 7 and 14 of No. 266,090 for an injunction, but without costs.

Decision. Coxe, J., United States District Court, filed July 23, 1891, John A. Shields, clerk.

The above decision sustaining the broad Brush storage battery patent will, doubtless, give just what has been needed commercially to develop the storage battery. The limited character of practical applications of the storage battery has been principally due to the uncertainty in the public mind as to who controlled it. This decision will give stability to the industry, and a decided boom may be looked for in an industrial sense.

A STAY GRANTED.

THE EDISON INJUNCTION IN THE INCANDESCENT LAMP SUIT SUSPENDED FOR SIX MONTHS—REMARKS OF JUDGE WALLACE — INTERESTING STATEMENT OF THE LAMP BUSINESS—APPEAL ALLOWED.

Another week has passed—a way weeks have—and further proceedings in the important incandescent lamp litigation are to be chronicled. The question of the settlement of the decree to be entered in the Edison incandescent lamp suit; the moving of a stay of the injunction, granted Edison by Judge Wallace, and the deciding of the amount of the bond which the defendants should give, brought the counsel for the Edison and the United States Companies before Judge Wallace, in Chambers of the United States Circuit Court, Wednesday of last week, July 22. It was agreed that $50,000 would be an equitable sum, and the United States Company was given the usual ten days' time in which to execute a bond in that amount. Justice Wallace then signed the six months' stay of the writ of injunction pending the appeal. The decree in favor of the Edison Company was formally entered, and Commissioner Shields was appointed Master of the Court to take evidence as to the amount of damages to be paid. The appeal to the United States Circuit Court of Appeals for the Second Circuit was allowed by Judge Wallace, and will be one of the first cases before this newly-created tribunal.

The Edison Company was represented by Grosvenor P. Lowrey, Major S. B. Eaton and R. N. Dyer; the United States Company by Elihu Root, Gen. S. A. Duncan and Leonard E. Curtis.

In moving for a stay of the injunction, several affidavits were presented, full of interesting history relating to the incandescent lamp industry. The following is the substance of the statements made by the defense:

The manufacturers of electric light apparatus have not, at least until within the past year or two, sold the product of their shops to the public indiscriminately, as ordinary articles of manufacture are sold, but at the outset adopted the policy of selling complete outfits, or, as they are termed, "plants" of apparatus, to persons desiring to use them either for lighting separate buildings, or for central station lighting, and have refused to sell separately the different parts making up the system. For instance, a company manufacturing electric light apparatus, would not sell its lamps for use with dynamo machines made by any other manufacturer, or its dynamos for use with lamps of any other manufacturer. This policy was was strictly enforced by all of the prominent companies at the outset and by the Edison Company among others, and as a rule has been maintained by all of them until quite recently. Each manufacturing company constructed the different parts of the apparatus with direct reference to their use with each other, and, as a rule, these parts were not adapted for use in the systems of apparatus made by other manufacturers.

For the purpose of public lighting from central stations, the manufacturing companies organized local corporations in various cities and towns, which were known as sub-companies or illuminating companies, and frequently took a stock interest in such companies and required them to agree not to purchase apparatus from any other manufacturer. The central stations of such companies were equipped with apparatus which was wholly of the manufacture of the particular company organizing it, and the sub-companies purchased their supplies, such as lamps for renewals and the like, from their respective parent companies.

As a consequence of this method of doing business, it has resulted, in many instances, that in the same city or town there are two or three and sometimes more different illuminating companies, each using the apparatus of the particular manufacturing company under whose patent it is licensed, and from the nature of the case, each of the manufacturing companies is more or less hostile towards the illuminating companies in competition with that in which it is interested.

The Edison Electric Light Company has organized a considerable number of such illuminating companies in different cities and towns, and has granted to many of its sub-companies or illuminating companies, especially those organized in the principal cities of the country, exclusive licenses for such cities to use and sell the apparatus

covered by the Edison patents, including the patent in suit.

In an incandescent lighting plant, whether for an isolated building or for central station lighting, the lamps themselves constitute but a small part of the entire apparatus, the cost of the lamps being only about two and one-half per cent. of the cost of the whole plant.

The defendant commenced the manufacture of incandescent lighting apparatus, including incandescent lamps, in the Summer of 1880, and has continued such manufacture down to the present time, and has sold and installed a large number of incandescent lighting plants, both for isolated lighting and for central station lighting, the entire number of plants being about 1,050, with a lamp capacity of about 350,000, and representing an investment by the purchasers of about $5,000,000. About 300 of these plants were installed before this suit was brought.

Up to the Summer of 1889 the defendant manufactured its incandescent lamps at its factory at Newark, N. J., but, owing to certain business arrangements which had been made shortly prior to that time between the defendant and the Westinghouse Electric Company, it was then found advantageous to suspend the operation of such lamp factory for the time being, and have its lamps made under contract by the Sawyer-Man Electric Company, at the factory of the latter company in this city. Such lamps, however, are made under patents owned by the defendant, and of styles and grades specified by defendant to suit the requirements of its plants.

The defendant's factory at Newark, however, has not been dismantled, but has been kept standing fully equipped with tools and machinery, and ready to start up at any time it may be found desirable, and the superintendent and skilled workmen of the defendant were transferred to the Sawyer-Man factory, where they are available to the defendant for re-employment in its Newark factory at any time.

Other manufacturing companies besides the plaintiff and the defendant have put in a very large number of plants, both for central station light and for isolated lighting with incandescent lamps. The aggregate lamp capacity of the incandescent lighting plants installed by the Westinghouse Electric Company up to the present time is about 800,000 representing an aggregate investment by the purchasers of approximately 20 million dollars.

The aggregate lamp capacity of the incandescent lighting plants installed by other companies than the Edison and Westinghouse will not fall short of 900,000 lamps, making a total lamp capacity of incandescent lighting plants sold and installed by companies other than the Edison of about 2,000,000.

Upon a conservative estimate, the aggregate amount of capital invested in the incandescent lighting plants which have been sold and installed by other manufacturers than the Edison Company is from 40 to 45 millions of dollars.

The apparatus made by different manufacturers, and in many cases different styles of apparatus made by the same manufacturer, require different grades and styles of lamps, and in order that the apparatus should work in a practical way, lamps must be employed of the precise kind for which the apparatus is constructed. Quite a number of the different kinds of lamps used with apparatus of other manufacturers are not made at all by the plaintiff; and it is specially true, in regard to the alternating current system supplied with 50 volt lamps, that plaintiff does not manufacture a lamp that is well adapted for use therewith.

This system, since its introduction in this country by the Westinghouse Company in 1886, has entered very widely into use, much more so than any other system, and to day more 50 volt lamps, such as are used in that system, are required for renewals than are required of any other grade of lamps. During the present year the Edison General Company has introduced a 50 volt lamp and sought in numerous instances to substitute this lamp for other makes of 50 volt lamps in central station lighting, but with very little success. Their failure in this regard is believed to be due to the fact that to make a serviceable lamp of this grade, which is of quite low resistance, the process of hydrocarbon treatment is essential; but this the Edison Company cannot use, since it is covered broadly by the defendant's patents.

The requirements of very high resistance lamps, such as are used on the 100 or 110 volt circuits of plaintiff's plants, and of comparatively low resistance lamps, such as are used on the 50 volt circuits of the alternating system, are in many respects quite different. As has been repeatedly stated by Mr. Edison, the Edison lamps are made with carbons of high specific resistance, produced by carbonization without subsequent treatment, while the lamps made by the defendant and other companies working under its patents have carbons treated subsequent to carbonization by the defendant's hydrocarbon process. The Edison kind of carbon appears to be peculiarly unsuitable for 50 volt lamps, while the defendant's treated carbon has been found by experience to be peculiarly well suited for such lamps.

In addition to this there are many lamps of various kinds and grades required for different plants which are not made by the plaintiff at all, and which it would require considerable time and experience to manufacture properly.

A very large proportion of the 2,000,000 incandescent lamps referred to as having been installed by companies other than the plaintiff, are used in the alternating current system of distribution for lighting from central stations in which the light is supplied to the public and to private consumers as gas is supplied by a gas company; and if the operations of such central stations should be stopped or seriously interfered with, through inability on the part of such companies to get proper lamps for renewals, it would result in great inconvenience to the public as well as in great loss to the local lighting companies. These companies also give employment to a large number of men, probably not less than 10,000.

The plaintiff has only one lamp factory, situated at Harrison, N. J., and it would be extremely dangerous for the lighting business of the country to make the entire supply of lamps dependent upon any one factory. The danger of fire in such factories is great. The defendant's factory was partially burned out some three or four years ago, and it was found impossible to get it rebuilt and in running order again so as to supply its normal output of lamps until some six months after the occurrence of the fire. In the meantime, the users of defendant's plants suffered great inconvenience from their inability to get proper lamps for working with their apparatus, although other manufacturers attempted to supply them. With the present greatly increased magnitude of the business, if the manufacture of lamps were confined to a single factory, a like accident would entail an almost incalculable loss to central station companies and a most serious inconvenience to consumers supplied by them, both public and private.

It is estimated that the capital invested in the manufacture of incandescent light apparatus, outside of the Edison Company, is not less than from 15 to 20 millions of dollars, and the number of hands employed in said business must be not less than from six to eight thousand.

By far the greater part of the business of these companies consists in the manufacture of apparatus of the alternating current system, which has never been manufactured by the plaintiff, and which it could not supply without infringing on the patents of the Westinghouse Company, which cover said system broadly, and the alternating system has a very large field which cannot be reached by the plaintiff's direct current system.

The investment of substantially all this capital and the existence of substantially all the incandescent lighting business of companies other than the plaintiff, has resulted mainly and directly from the delay of the plaintiff in bringing and prosecuting this suit. For several years subsequent to 1880, the plaintiff and the defendant were the only manufacturers of incandescent lighting apparatus in this country doing any commercial business.

If the present suit had been brought promptly in 1880, when the plaintiff first had knowledge that defendant was manufacturing and selling incandescent lamps, and had been prosecuted to the present decision with reasonable diligence, the cash investment of the defendant in this branch of its business would have been very small; probably would not have exceeded $50,000.

The principal business of the defendant in 1880, and prior thereto, was manufacturing apparatus for arc lighting. When it entered the business of manufacturing incandescent lighting apparatus, it did so in good faith, under advice of its counsel that the apparatus it proposed to manufacture did not infringe any valid patents held by other companies, including the plaintiff herein. It soon had brought to its attention, however, the general claims made by the plaintiff that no incandescent lighting apparatus could be made without infringing some of its patents; and the defendant's officers and directors, who were also its principal stockholders, assumed that if the plaintiff had any claims against the defendant's apparatus in which it had confidence, it would at once commence suit and have the matter determined by the court. No such suit was brought, however, and the officers and directors of the defendant became convinced, as year after year passed without the institution of any suit, that the plaintiff's threats in regard to patents were made merely for the purpose of influencing business, and without the intention of instituting any such suits, and they invested more and more capital in the incandescent lighting branch of their business, which increased rapidly until at the time when this suit was commenced that branch of the business had become the principal one. At that date the entire capital invested in defendant's business had reached a total of more than two and a half millions of dollars, and fully three-fourths of its business related to incandescent lighting.

When this suit was begun (May, 1885) defendant was advised by its counsel that under the provisions of Section 4887, Revised Statutes, as the same had repeatedly been interpreted in the courts, the several patents to which the bill related, including the patent now in suit, had expired, and that the pendency of the suit was no reason for the discontinuance of its business. Under this advice, defendant materially enlarged its manufacturing plant to meet the growing demands of the trade.

Other affidavits were presented in the interest of the defense, showing that many lighting companies preferred the lamp of the defendant even at a higher price. Some of the companies, particularly the local lighting company of Baltimore, stated that the selection of lamps was left to the purchaser of the electric plant, and these parties preferred lamps other than those manufactured by the plaintiff.

THE COUNSEL AND JUDGE WALLACE.

After reading the affidavits, a very interesting discussion occurred between the court and the attorneys, as follows:

Judge Wallace said the only question in his mind was, whether the considerations presented were such as would lead to the suspension of the injunction pending appeal. He thought there was no impropriety in saying that he anticipated such an application would be made, and his impression was extremely favorable to granting it.

Mr. Root suggested that there might be a question as to the form of the injunction. It had been suggested during the trial that any discussion of the subject of laches would more properly arise upon the consideration of the final decree. The court stated that he did not care to hear any argument on the right to injunction, as that question was settled. Mr. Root explained that they did not propose to question the right to an injunction, but to urge upon his Honor some considerations which might lead to a slightly different form of injunction from that ordinarily made. Judge Wallace said he thought the plaintiff was entitled to the usual injunction, but the question was whether it should not be suspended until there was a decision by the Appellate Court. He had considered the question somewhat before making his decision and thought of saying something about it in his opinion, but concluded he had better not until he had heard counsel.

Mr. Lowrey thought the subject of laches might give some rights to the defendant if it were manufacturing, but since it was not and has nothing to commend itself to his Honor except its contracts to supply lamps, which was just the same as saying that although it infringes, it may continue to do so, because it had contracts to do so, there is no good reason for a stay.

The court thought there might be a case where the recovery of royalties would be sufficient to indemnify for infringement, but where the granting of an injunction might cause tremendous inconvenience. A decree providing such relief as to practically deny the injunction would be of no force. What influenced him very much when he decided the case was the circumstance that there had been a long delay in the prosecution of the suit, and that the patent was one which was very well calculated to engender doubt in the minds of people who were making incandescent lamps, as to whether it was good for anything, and the additional fact that during this time a large amount of capital had been invested and a great many men were undoubtedly employed in making the lamps. If some one had the right to set up this patent against the infringers they should have commenced early and at the right time.

Mr. Lowrey reminded the court that their hands were tied until the Bate and Hammond decision in 1889 cleared the sky, and they proceeded vigorously when the superior authority had told them they had a right to proceed. Prior to that the situation, in view of the foreign patents, was such that people did not think it worth while to spend their money.

The Court: But you did not wait for the Bate and Hammond decision before bringing suit.

Mr. Lowrey: The suit was brought before Bate and Hammond, and brought upon the advice that such would be the decision of the Supreme Court.

Mr. Root stated that during the five years of inactivity of the plaintiff, the agents of the defendant had over and over again said: "Why don't you sue if you say this patent is controlling?"

Judge Wallace said if the case could not be reached in four or five years, before the institution of the new system, the question would be a more serious one than it is now. Where parties did not assert their rights for several years it looked as if they did not feel that there was any necessity for it or that they had no rights. He remembered well a case in which an injunction was stayed simply because great loss would result to the defendant, and it was under this very act allowing a stay during the pendency of the appeal to the Supreme Court, and it was a case of a reissued patent which had been held void in another circuit but was sustained, and nevertheless on appeal the stay was granted because great injury would result to the defendant without any reference to public rights at all. He thought the cloud that hung over this patent was in its claims and in the language of the patent itself. That was the great cloud that hung over it. He did not blame any infringer very much for assuming that he could go on and make any sort of incandescent lamp without fear of that patent. He noticed that no two judges that had ever had it before them agreed upon it. Perhaps two did but only one delivered an opinion. If they had both delivered opinions he presumed they would not have agreed. After some further discussion he added:

"I am practically called upon to suspend this injunction for about six months, and I think, in view of the fact that the suit was not brought for five years after it could have been brought, in view of the fact that there is a fair doubt as to whether my decision will be affirmed, and in view of the fact that a large investment has been made by those who have probably thought that they could go on safely notwithstanding the decision, and in view of the fact that large numbers of men have been and still are employed in the manufacture of these lamps, I think I should be justified under all these circumstances in the exercise of my judicial discretion in suspending the operation of the injunction."

A New Underground Company.

The Pittsburg Underground Electric Construction Company was organized July 24, to equip electric and cable street railways with the underground system, under patents granted to Mr. John J. Miller. The gentlemen composing this company are cautious, conservative people, and it is evident the project is a good one, and from the position the gentlemen hold in the business world, the combination is of great financial strength.

The officers and directors elected were Mr. C. D. Robbins, a successful oil producer of Washington County, as president; Mr. D. J. Rex, manufacturer, as secretary and treasurer; Mr. C. F. Shoemaker, superintendent of Liggett Spring & Axle Company; Mr. F. A. Mann, nut and bolt manufacturer, Cleveland, Ohio; Mr. F. J. Osterling, architect, and Mr. John J. Miller, of the Robbins Electric Company, the inventor of the system, comprise the directory.

The company is organized with a capital stock of $300,000, of which $96,000 was paid in on the day of organization.

We learn that Philadelphia, Washington and New York people have investigated the patents of Mr. Miller, and have invited him to visit their respective places, with a view of constructing and equipping a trial plant. The inventions consist of a complete system of street railway appliances, motors, underground trolley, rail and roadbed.

Another interesting contribution to our Advertising Forum appears in this issue of the REVIEW. Mr. Chas. A. Schieren writes entertainingly and pointedly on this important subject.

BOSTON TELEPHONE EXCHANGE.

(*Continued from page 298.*)

telephone exchange, a line of manufacture in which they hold a unique position in the electrical industries of the world, but also the electric lighting plant, many of the underground cables and all or almost all of the minor electrical apparatus used throughout the building. The entire plant was also installed and completed in working order by the construction and installation staff of the Western Electric Company.

The advancement in telephone switchboard construction has been very rapid of late years, and as an instance of the extraordinary perfection attained nowadays in this complicated work the Boston switchboard is especially noteworthy. The framework of the board and the mechanical parts were all made at the Chicago factory of the Western Electric Company, while the switchboard cables were all formed and connected to the spring-jacks in the New York factory, the various parts then being packed and shipped to Boston and the whole assembled in the new telephone building there. We think this is a piece of elaborate mechanical work which any corporation may well be proud of having carried out successfully. The magnitude of the job can be estimated when it is said that the number of soldered connections in the switchboard is 448,856, and the length of wire some 2,745 miles, all of which, of course, is in comparatively short pieces; while the various moving parts in the board sum up to the very respectable total of 133,126.

The underground system of the New England Telephone Company has now attained very large dimensions. Standard telephone cables of the well known "Patterson" and "Faraday" types, supplied by the Western Electric Company and the American Electrical Works, respectively, are used throughout the city with excellent results. The work of moving the exchange from the old office to the new was carried out by means of aerial cables, some 500 and odd miles of wire being needed for the transfer. The new exchange was inaugurated a week or two ago; the change over to the new office being made in a few minutes and without entailing any appreciable interruption or delay in the service.

The work of removal was directed by general manager J. N. Keller and his assistant, Mr. W. J. Denver, who has immediate charge of the Boston division of the company's service. Mr. C. A. Perkins, the company's engineer, has charge of laying out the underground cable routes and the supervision of the construction and underground work generally. The purely electrical work connected with the switchboards and other parts of the operating plant is under the direction of Mr. I. H. Farnham, electrician.

The full list of officers of the New England Telephone and Telegraph Company is as follows: Thomas Sherwin, president; Henry S. Hyde, vice-president; S. W. Leedom, auditor and secretary; William R. Driver, treasurer; F. A. Houston, attorney; J. N. Keller, general manager; W. J. Denver, assistant general manager; I. H. Farnham, electrician, and C. A. Perkins, engineer.

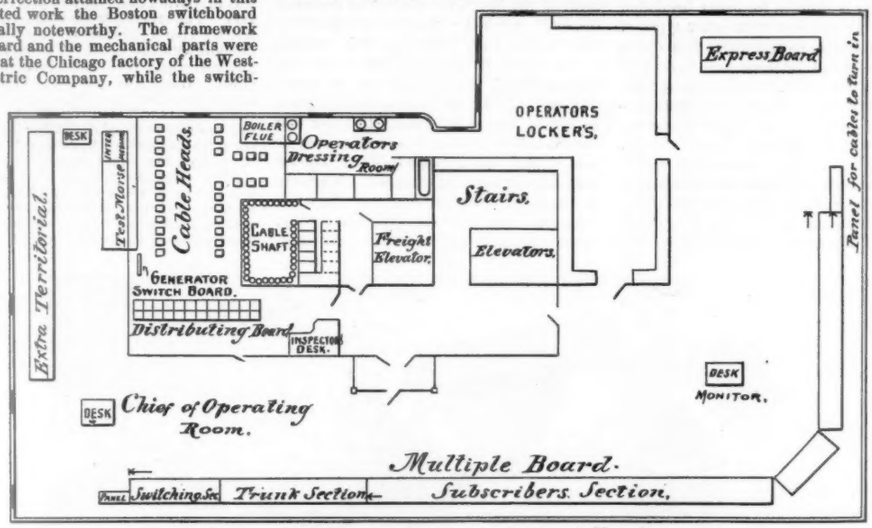


FIG 4.—PLAN OF NEW ENGLAND TELEPHONE COMPANY'S NEW EXCHANGE.

A Point in Edison's Favor.

In the suit of E. B. Welch against Edison, for $250,000, Judge Nelson, of Boston, on motion of the defendant, decided that the plaintiff should produce the letters within 30 days, and also file a bill of particulars, settling on what patents, inventions, instruments and improvements he claims to have an interest. He is also ordered to state what inventions he has requested the defendant to transfer to him in which he says he has an interest. The plaintiff bases his claim upon an alleged contract made with the defendant in 1869, by which he agreed to give him one half interest in a patent upon which he was then experimenting, and upon all future inventions which he might make. General Butler is one of the plaintiff's lawyers.

Mr. W. H. Patton, inventor of the Patton motor, slipped and fell from a moving train at Chicago, July 25, and broke his arm.

NEWSPAPER MEN OF NEW YORK.

Colonel Cockerill, editor of a morning and evening daily, is now really enjoying life.

Jos. Howard, Jr., in his column in the *Recorder*, was never so happy. There is a freedom and vitality about his journalistic work that makes it truly refreshing almost always—but not quite always.

That daily "Contest of Trenchant Pens" in the New York *Recorder* gives an opportunity to writers of pith and point to prove one another in error in parliamentary and journalistic style. A number of good things have appeared in this "Arena," and no doubt many more may be expected.

Charles O'Connor Hennessy, city editor of the *Daily News*, has been indicted for the purpose of testing the constitutionality of the State law requiring all newspapers not to publish accounts of the killing of criminals by electricity. Mr. Hennessy and his *News* are now envied by the New York press generally. Bourke Cochran is his attorney.

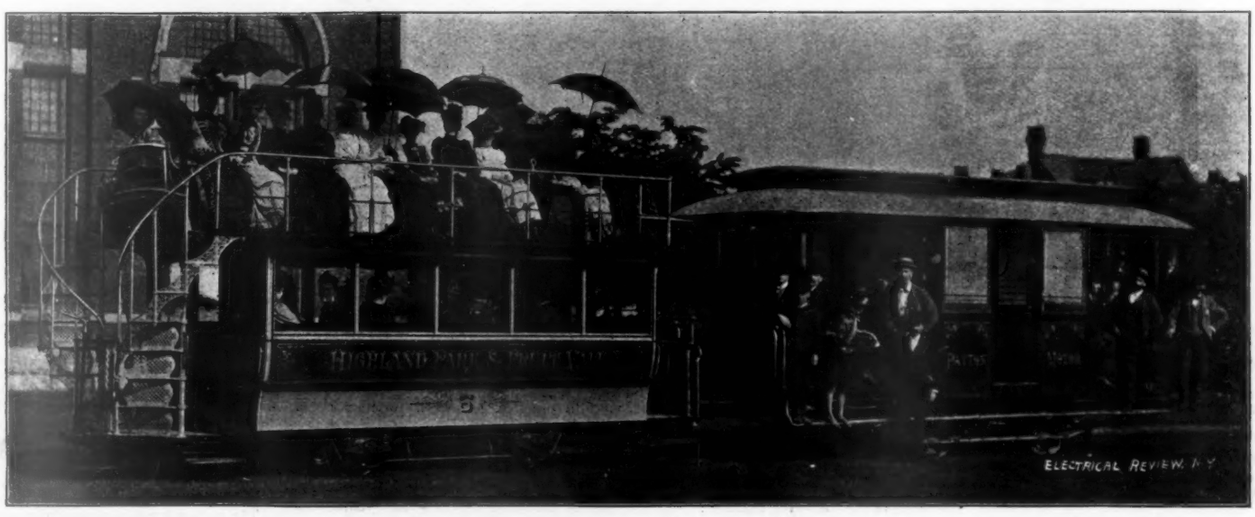
W. J. Arkell, of *Judge* and *Frank Leslie's Illustrated Weekly*, each 10 cents a copy, for sale on all news-stands, advertising rates made known on application at the *Judge* building on Fifth avenue, New York—(we don't get a cent for this)—proposes to give a tea party to President Harrison at Saratoga, in August, and invite a number of leading republicans and, possibly, a few democrats. There is a good deal of originality about Editor Arkell, and a well thought-out meaning to all that he does, whether it is or is not announced with a brass band and fire-works.

The Perfected Patton Electric Car.

Our illustration is an excellent reproduction of this new motor car as it appeared on the tracks at Pullman, Ill., recently, drawing as a trailer a handsome double-decked street car, invented and patented by Mr. E. C. Sessions, of Oakland, Cal. The motor has performed some remarkable work during the past three weeks, and has been submitted to some crucial tests, all of which have demonstrated it to be a success. It was impossible to secure an interior view of the apparatus, but a short explanation of its working is given herewith.

The center of the car, as shown in our illustration, is enclosed, and in this cabin or enclosure is contained the entire motive power of this new system. The apparatus consists of a mechanical and electrical combination, as follows: A gas engine, dynamo, motor and storage batteries. Our readers may think the above combination necessarily complicated, but the following short description will enable them to understand the simple working of the apparatus:

A gas engine is placed in position in the center of the car resting on the trucks, and is geared direct to the dynamo by means of a friction pulley, no belts whatever being used. The dynamo furnishes the current for the motor from which the propelling power of the car is obtained. In going down a grade, running on a level piece of track, or carrying a small load with a car whose generating power is entirely self-contained, there would necessarily be a surplus of current. Here the question arises, what shall we do with the surplus? In most cases this would be considered a dead loss, but it is not so with the Patton system, for it is here that the storage battery is made an important feature. The batteries are arranged to take up the surplus current that would otherwise be wasted. The batteries are charged in series but discharged in multiple, so that when we reach a point where an extra amount of power is required, the batteries stand ready to assist the dynamo in supplying it. Another and especially important work of the batteries is as follows: In most cases a gas engine is started by hand power, but here the storage battery is made to do an important duty. When ready to start the engine, the current of the batteries is thrown on, thereby making it perform the work of a motor, and this immediately starts the engine, after which the batteries are thrown off and the dynamo at once begins to generate current for the motor, which is geared direct. The storage batteries are conveniently placed under the seats of the car. Mr. W. H. Patton, the inventor and patentee, is elated over the success of his system, and has reason to be proud of the exceedingly favorable comments and congratulatory letters received from gentlemen who are competent to judge; all of these are of the one opinion that the motor is a success mechanically and commercially. The company have offices at 45 Lakeside Building, Chicago.



NEW PATTON MOTOR CAR AND TRAILER.

* * An electric railway will be built immediately between Owosso and Corunna, Mich.

* * Miss Katherine Drexel's convent, which is soon to be built at Andalusia, Pa., will be equipped with all modern conveniences, including electric lights.

* * A novelty among vehicles in this country—an electric carriage—is now being constructed at the factory of M. W. Quinlan, in Brookline, Mass., from plans drawn from a photograph of a similarly propelled carriage said to be in present use in London.

* * Three months ago the Thomson-Houston Company had orders for 1,000 street railway motors ahead of its deliveries. The company has since been turning out and delivering about 70 motors per week. But to-day the orders are 1,100 motors ahead of the deliveries.

* * The owners of the new Chicago *Herald* Building have placed an order with the Western Isolated Lighting Department of the Thomson-Houston Electric Company for a plant consisting of one 10,000 and one 15,000 watt arc dynamos, with 50 double carbon arc lamps, which will be novel in some respects. Special permission was obtained from the city electrician for the concealing of the arc light wires in this building, and a high grade of rubber covered wire will be used, protected by interior conduit and laid in the cement flooring. A circle of six lights will be placed on the flagstaff, so arranged that they can be raised or lowered at will with perfect ease by one man. Special fixtures for suspending the arc lamps, a number of which will be placed on the front of the building, have been designed and the wires leading to these fixtures will be brought through the building front. In order to accomplish this, it will be necessary to drill, in some places, through five feet of brick and terra cotta and in other places through about three feet of solid granite.

The Thomson-Houston M.P.-250 Generator.

The erection of power stations of large capacity for operating electric street railways in our large cities, has created a demand for generators of greater output than have been heretofore employed. The general construction of the latest type of railway generator, brought out by the Thomson-Houston Electric Company, can be readily seen from the accompanying illustration.

The armature of the M.P.-250 dynamo is of the ring pattern, and so constructed that opportunity is afforded for better insulation than can be obtained with other types of armatures, and the danger due to great difference of potential between any two of its conductors is avoided. This is a most valuable and important feature. In case of accident or injury to any coil, it can be readily repaired, without affecting in any way the remaining coils. The construction of this armature affords the best possible ventilation.

One of the most important features of this generator is the arrangement for lubrication and good alignment of the bearings. The boxes are made in two parts and are entirely separate from the stands. On the top of the stand is a seat into which the spherical surface of the box fits and in which the box is free to move. The bolts which secure it to the stand are smaller than the holes which are drilled through the box, so that a slight play of box in the seat is permitted. The bearing shells or linings are removable, and are made in the following manner:

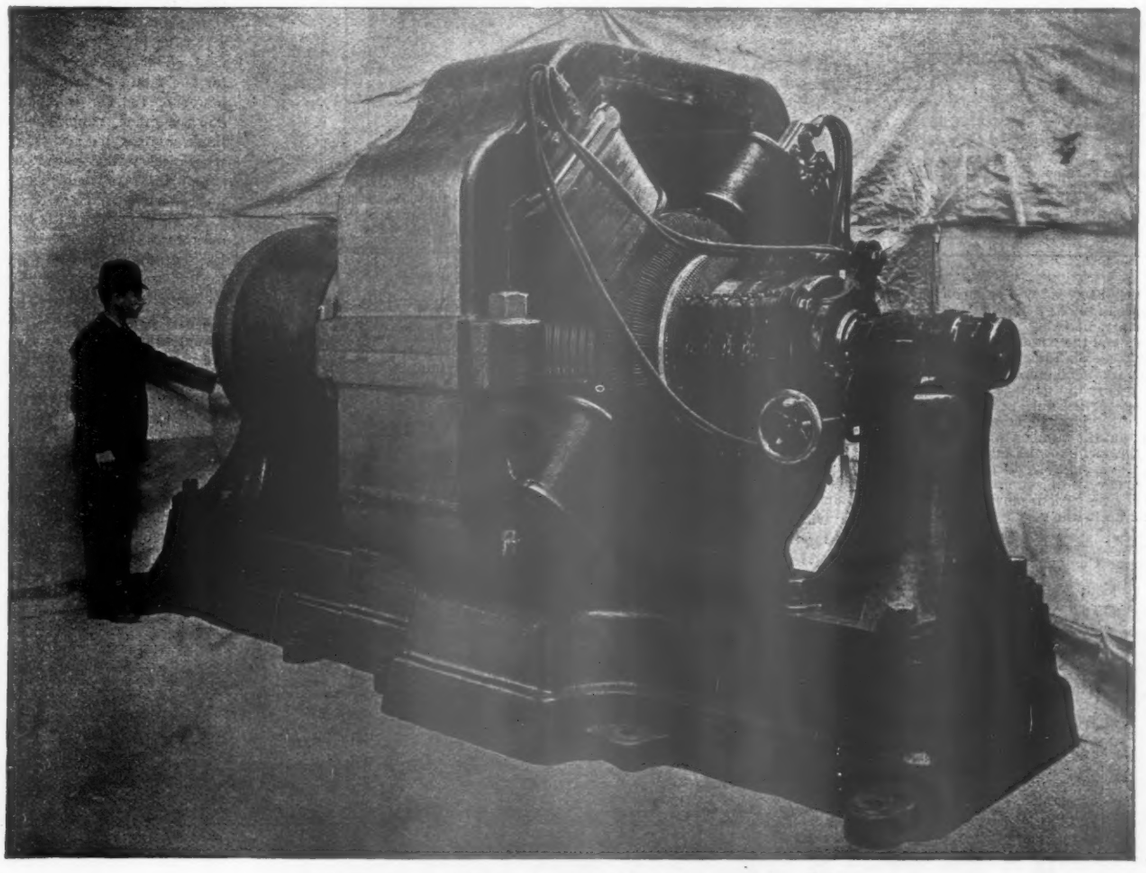
A skeleton shell of brass is made, the interstices of which are filled with Magnolia metal. This is then bored and reamed to size, oil-ways being cut so that the oil circulation begins at the point where the oil rings touch the shaft. This method of manufacture permits a perfect circulation of oil, ensures the cool running of the bearings, and greatly reduces the care and attention required by the dynamo when in operation. This type of box and bearing lining has proved so satisfactory that it is now being introduced in machines of smaller size, and will in future be used on all machines of large capacity. In order that the outboard bearings may be perfectly aligned with the other bearings, the stand of the extension has two adjustments—one in a horizontal and the other in a vertical direction. These adjustments are made by screws. Whenever it is necessary to examine bearing linings, the armature is jacked up about one-sixteenth of an inch, so that the bearing is relieved of the weight, two bolts removed from each stand, and the entire box taken out. In case it is not desired to remove the box, the cap can be taken off and the bearing linings readily removed. The movement of the brushes is effected by means of the shaft, on which a small worm is attached, and which in turn works in a rack fastened to the yoke. By means of this a very fine adjustment of the brushes can be made. The worm locks the yoke so that it cannot be moved except by hand. In order that the conductors inside the armature may be held securely in place, an adjustable, internal wire support has been designed. When the armature is being wound the wires are forced into position so that they cannot sag, vibrate or chafe the insulation. All tendency to short-circuiting is thereby avoided and the position of the wires assured.

The commutator, which has 180 sections, is designed and constructed with great care, and in practice has been satisfactory in every way.

In practice, this dynamo will have its fields separately excited, although the connection at the switchboard is so arranged that by throwing a switch the dynamo can be made self-excited, should emergency require it.

The total floor space occupied by the M.P.-250 generator is 13 feet 3½ inches by 7 feet 1 inch. The height of the machine is a little less than 8 feet. The pulley is 43 inches in diameter and has a 35 inch face. The speed is 400 revolutions per minute. The dynamo, complete, weighs about 21 tons.

* * Work has been commenced on the Interstate Street Railway (electric), connecting North Attleboro, Attleboro, Pawtucket and Providence. The Clemons Electric Manufacturing Company, M. E. Clemons, treasurer and manager, have the entire contract for building the same.



THOMSON-HOUSTON ELECTRIC COMPANY'S M.P.-250 RAILWAY GENERATOR.

Smelting Silver at the Thomson-Houston Factory.

Yesterday, Mr. Alton, who has charge of the meter work in Factory D, melted up his silver scraps. The fact is that a good deal of silver is annually put into the small commutators for the meters.

A good deal of dust and filings, mingled with more or less waste fibre collects, every bit of which is carefully preserved for the melting pot, until ten or a dozen pounds has collected. Then a celebration like that of yesterday occurs.

First, the crucible was prepared and its fuel of gas and air ignited. Before long it was pretty hot and ready to proceed to business. The crucible is about the size of a tinsmith's charcoal stove, made of sheet iron filled in with fire brick. The melting pot is put inside and the whole surmounted by a cover. When the pot was first filled it melted the silver quite leisurely for it wasn't silver dollars with 15 per cent. or so of alloy, but was the pure stuff. After it got a little accustomed to its work, however, it reduced the bullion to a liquid state in short order.

Then came the pouring off. A little sal was put in to make a flux. Mr. Alton had an idea that a search-light carbon would make a good mold. These carbons look like black pieces of English coltsfoot rock candy, magnified to the size of a handspike. He laid one down on a sheet of asbestos paper, stopped each end of the fillets—if we may architecturally describe the space between the fluxings of the carbon—with black putty and then uncovered his crucibles. Taking the pot out with a pair of tongs, he poured out about $6 worth of silver. It made a bar about as big as a stick of candy looking like a stick of solder. He wasn't satisfied with the result and so went back to his usual method of making a mold.

The carbon brushes of a railway motor are made of small pieces, some two inches long and an inch and a half wide. They are half an inch thick. With one of these for a bottom and four others around it, bound together by a piece of copper wire, a box was made which, set on a fire brick, constituted an excellent mold. This would hold all the silver the pot would contain. When it was filled and the contents had been taken out with the tongs and cooled off, it made a silver brick about as large as a ten cent plug of tobacco. It didn't look very heavy, but when it was sent down stairs on the dumb waiter to be weighed, the paper came back marked one pound and three ounces. There was about $30 worth in the handful. The work of melting up this silver scrap continued all day.—*Lynn, Mass., Press.*

Mather Electric Company's New Generators and Motors.

Recognizing the demand for power transmission by means of the electric current, the Mather Electric Company, of Manchester, Conn., has brought out a series of machines for that purpose which, while embodying the essential features of the well known ring

FIG. 2.—MATHER ELECTRIC COMPANY'S TWO-POLE MOTOR.

type, can be more readily insulated against the high potentials required for power service.

One of the essential features of the old type was a field magnet having the form approximately of the magnetic lines of force and consisting of one piece. In the new type the cores of the field magnet are straight, permitting the use of coils of wire that can be wound separately on a machine, while the rest of the magnetic circuit is practically a ring and the whole, including the cores and pole pieces, is cast in one piece without a joint.

The motors are built of 1, 3, 6 and 10 horse-power with two poles, and 20, 30 and 40 horse-power with four poles.

The generators are built of 30,000, 50,000, and 75,000 watts with four poles, and 180,000 watts with six poles. Drum armatures are used in all the machines. In the four pole machines the winding is such that the current has but two paths through the armature wires, and by a special method, devised by Prof. Anthony, no two wires having any great difference of potential are brought near each other.

The illustration, Fig. 1, which represents the 75,000 watt generator, shows the general character of all the four pole machines. The cut shows clearly the field magnet in one casting.

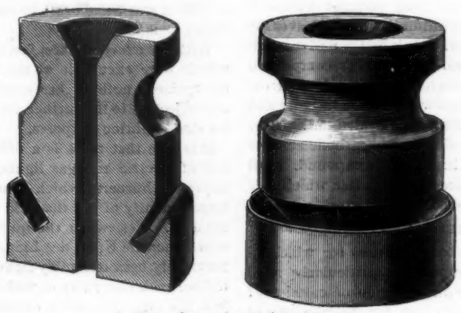
In the 180,000 watt six pole machine the field magnet is cast in two halves but divided through the middle of two opposite poles instead of across the magnetic circuit.

Fig. 2, shows the two pole form adopted for the motors up to ten horse-power. These small motors are wound and kept in stock for 220 volts, but will be wound on order for 110 or 500 volts. The winding is such that in no case is there a loss in the armature of more than four per cent., and the speeds run from 1,500 revolutions for the 10 horse-power, to 2,500 for the one horse-power. The variation in speed from full load to no load is never more than four per cent.

Manager Littell should see that there are enough straps in the electric cars to accommodate those who are obliged to stand. Leather is comparatively cheap, and rope is cheaper. But let us have something to hang on, anyway.—*Buffalo, N. Y., Times.*

A New Porcelain Insulator.

The accompanying cut illustrates a porcelain insulator of new design. The slot around the base of the insulator, inclining downwards, effectively prevents a line of moisture covering the insulator from the conductor to the supporting base. These insulators are highly glazed, have a countersunk base, and are spoken of very highly by those who have used them. They are being placed on the market by the Central Electric Company, of Chicago.



A NEW PORCELAIN INSULATOR.

Another Electric Suit.

A bill of complaint was filed last week in the United States Circuit Court by Charles G. Perkins, of Hartford, Conn., against the Edison General Electric Company, for damages for the infringement of a patent claimed by him. Mr. Perkins, who is the inventor of the Perkins incandescent lamp, says that he invented an improvement in circuit breakers for electric lighting, which the Edison Company has manufactured without permission from him.

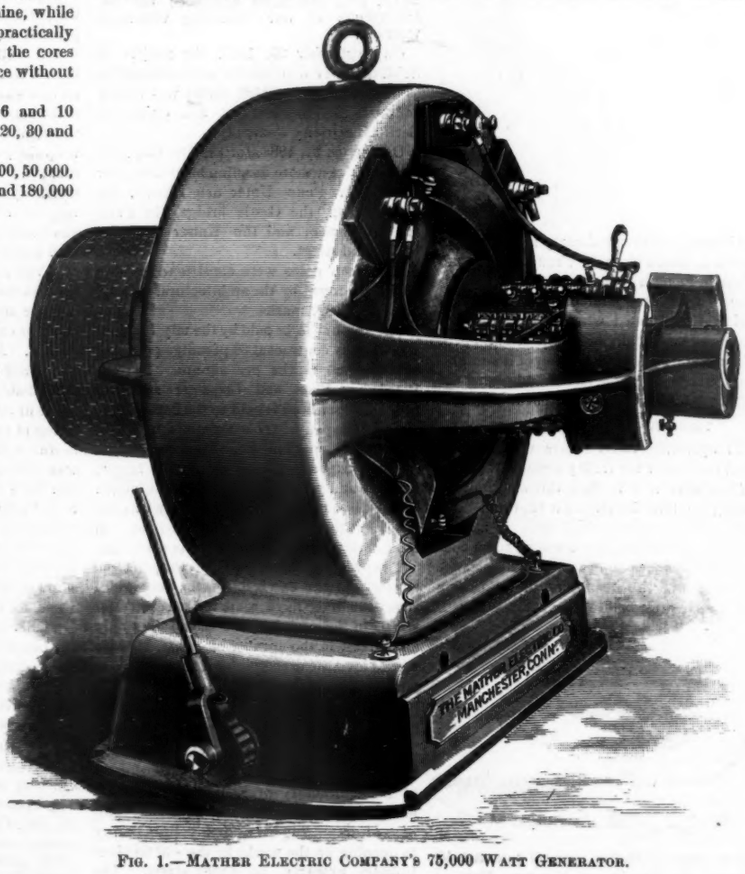


FIG. 1.—MATHER ELECTRIC COMPANY'S 75,000 WATT GENERATOR.

In Boston and many other cities where the electric system is used for street cars, a so-called "white post system of stops" is used. That is, the electric cars will only stop at posts which are painted white, and people who wish to take the cars are obliged to go to these points, which are generally the intersection of streets. Such a system, it is claimed, saves a great deal of time and enables the cars to make their trips more quickly. It has not been found inconvenient to the public generally.

Annual Meeting of the Rutland Electric Light Company.

The sixth annual meeting of the Rutland Electric Light Company was held at Rutland, Vt., July 14. President Francisco reported that there had been an increase of nearly $24,000 in the assets, which was due largely to the increase in the plant. The liabilities have increased about $10,000. The expenditures during the year were $478.80 more than the receipts, which Mr. Francisco said was due almost entirely to the low price charged for lights. He said the company had never done so big a business since it was organized as last year, and he considered it in better financial condition than ever before. The capital stock of the company is $100,000, of which a little over $50,000 is paid in. Out of 2,520 shares there were 2,025 shares of stock represented at the meeting.

The old board of directors was re-elected, with one exception. E. I. Garfield, secretary of the Thomson-Houston Electric Company, of Boston, was made a director in place of Guy H. Reynolds. The directors are: B. F. Pollard, Charles E. Ross, W. H. Valiquette, H. W. Cheney, E. I. Garfield, M. J. Francisco, Edson P. Gilson, Justin Batcheller, A. H. Abraham, Fred. H. Richardson and I. H. Francisco.

After the stockholders' meeting the directors organized by electing M. J. Francisco president and general manager, Justin Batcheller vice-president, C. E. Ross, treasurer, and I. H. Francisco, secretary.

ELECTRIC LIGHT NEWS

—— The erection of an electric light plant is talked of at Leroy, Fla.

—— The Malden, Mass., Electric Light Company has declared its usual two per cent. quarterly dividend.

—— We learn from the *Bureau County Republican* that an electric light plant at Princeton, Ill., was started July 4. The plant has a capacity of 30 arc and 650 incandescent lights. Thomson-Houston apparatus is used.

—— It is said that the net earnings of the Edison Illuminating Company, of New York, for the six months ending July 1, 1891, were $152,000, against $99,000 for the corresponding period last year, an increase of over 53 per cent.

—— As men stop to consider the points involved in the question of the town's going to the expense of putting in a pumping station and an electric light plant, it is believed they are beginning to see that the movement is not justified by sound business forethought.—*Attleboro, Mass., Sun.*

—— For such a small country, Belgium has made great progress in the adoption of electric lights. The city of Brussels has 544 arcs and 9,587 incandescents; Ghent has 222 arcs and 4,931 incandescents; Antwerp has 240 arcs and 1,481 incandescents; Liege has 384 arcs, 2,040 incandescents; Verviers has 655 arcs and 2,423 incandescents.

—— Quite an addition has been built to the supervising architect's office in the Treasury Department, and is to be used as a draughting room. The electric light system, which is extensive, is being put in by Messrs. J. W. Burket & Company, of Washington, D. C. The Johnson heat regulating apparatus is also being introduced by the Johnson Company.

—— McGill University, Montreal, is to be the recipient of a valuable electric light plant, consisting of dynamo and arc lamps. The plant is of the celebrated "Wood" system, manufactured and presented by the Fort Wayne Electric Company. Mr. W. J. Morrison, their general agent, together with Mr. A. J. Corriveau, president of the Canadian Electrical Construction, Manufacturing & Supply Company, Montreal, have been instrumental in securing the gift.

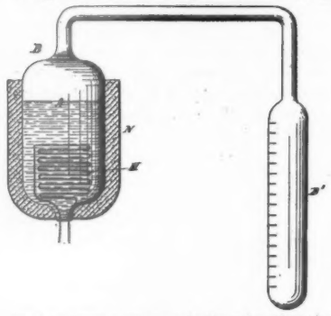
—— Another National Electric Company has recently been organized in Washington, D. C., under the laws of the State of Virginia, with a nominal capital of $1,000,000. The president is P. Mason, and the secretary and general manager is W. J. Dante, who has an office at 937 F street. The object of the company is to exploit a battery invented by the well known Captain Hussey. This is the fourth "National Electric Company" now in existence in that city, none of which is doing any business.

—— The firm of Dolese & Shepard, contractors and stone quarry owners in Illinois and Wisconsin, have recently installed an arc light plant of the Thomson-Houston system at their quarry at Hawthorne Station, Ill., for the purpose of facilitating the quarrying of stone at night. Twenty-five Thomson-Houston double carbon standard arc lamps are used for the purpose and are suspended from poles mounted on movable standards so that while blasting is in progress the lamps may be moved back from the edge of the quarry pit. The firm state that since putting the plant into operation they have not only largely increased the output of the quarry, but that the men working at night turn out more stone per man than those working during the day. This is probably due to the fact that the men working at night do not suffer from the heat to so great an extent as those employed during the hours when the sun shines.

PROGRESSIVE ELECTRICAL INVENTIONS.

ELECTRIC METERS.

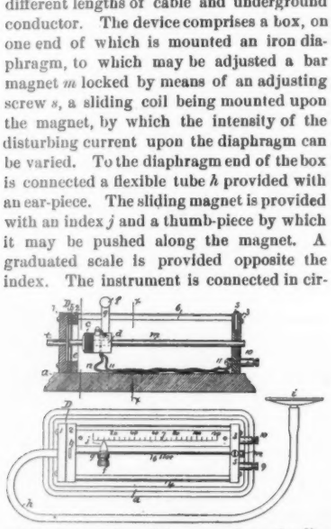
The accompanying engraving illustrates a novel form of electric meter due to Elihu Thomson. It comprises a bent glass tube having bulbs blown on the extremities, and one of which has sealed platinum wires leading to a platinum or other resistance within the bulb. The bulb containing the resistance contains alcohol or other vaporizable liquid which is placed in the tube and then boiled to expel the air, the bulb B′ being sealed while the vapor is still escaping,



so as to form a vacuum in the tube when the liquid condenses. The bulb B′ is marked with a graduated scale which serves to measure the current. The resistance conductor H is heated when connected in circuit, and the heat vaporizes more or less of the alcohol which passes over into the chamber B′ and is there condensed, the volume of the condensed liquid indicating the amount of heat generated, and with a proper graduation of the scale proportional to the square of the current, the height of the condensed liquid will indicate the amount of current which flowed through the resistance circuit.

ELECTRO-PHONOMETER.

With a view to determine the degree of interference of incandescent arc or harmonic telegraph circuits with telephone circuits, Isaiah H. Farnham, of Wellesley, Mass., has designed an instrument which he calls the "electro phonometer." By means of this instrument the difference in the degree of the disturbance caused by the circuits mentioned can be observed and recorded. The instrument is also useful in determining the amount of benefit derived from the use of a return conductor, or other attempts for the suppression of inductive disturbance, and for comparing the merits of one transmitter with another, for determining the talking qualities of different lines, and lines having different lengths of cable and underground conductor. The device comprises a box, on one end of which is mounted an iron diaphragm, to which may be adjusted a bar magnet *m* locked by means of an adjusting screw *s*, a sliding coil being mounted upon the magnet, by which the intensity of the disturbing current upon the diaphragm can be varied. To the diaphragm end of the box is connected a flexible tube *h* provided with an ear-piece. The sliding magnet is provided with an index *j* and a thumb-piece by which it may be pushed along the magnet. A graduated scale is provided opposite the index. The instrument is connected in cir-



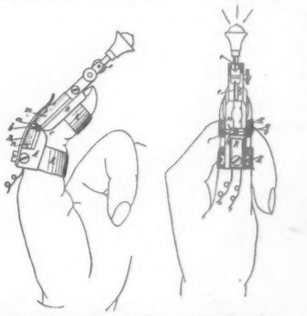
cuit and the index slides away from the diaphragm, thus decreasing the effect of the current circulating in the coils *c* upon that pole of the magnet which faces the diaphragm. When the index has reached the point where the sounds of the diaphragm become normal, the instrument is out of range of the disturbing currents and responds only to the high tension telephonic currents. The position of the index finger is then noted and the indication represents the comparative intensity of the disturbance in arbitrary units. By forming a record of these observations one line can be compared with another, and the disturbance on one date with that of another date, thus admitting of comparison and standardizing of the disturbances.

INSULATING CONDUCTORS.

A method of treating conductors for the purpose of insulating them has been recently patented by Charles Cuttriss, of New York. The salient points of the process are, using as a covering material slivers of cotton in the condition in which it leaves the carding machine. This is first passed through boiling water and compacted or compressed by being afterwards led through a narrow opening: it is then wound upon the wire and the whole immersed in a heated mixture of equal parts of shellac and carbolic acid, or some suitable insulating compound, until air bubbles cease to rise, after which it is cooled and finished.

MEDICAL LAMP.

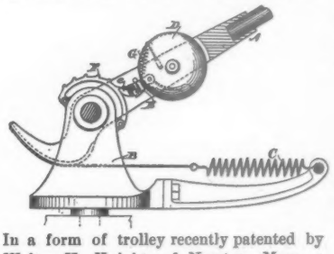
One of the subordinate uses for which incandescent lamps are particularly well adapted is the illumination of cavities of the human body, and for the uses of the surgeon, dentist or physician, prove invaluable. In the accompaning engraving is illustrated an improved apparatus designed to be secured to the thumb or finger for convenient manipulation in the examination of hidden cavities. The device comprises two plates A B, concaved to rest firmly upon the outside finger and provided with rubber straps to secure them thereto. These plates



are hinged together and carry insulated contacts *a b*, which close the circuit of the lamp when the finger is straightened out. A hinge is placed at the first joint of the finger and a spring R, insulated where it bears upon a segment B, normally holds the circuit open. When light is desired, the finger is straightoned, thus closing the circuit and giving the light where and when it is needed.

TROLLEY FOR ELECTRIC CARS.

In operating electric cars with an overhead conductor the trolley sometimes jumps off the wire and is then thrown up by its spring so that the circuit is ruptured, and, unless the driver or brakeman is at once notified of the fact, the car may run a considerable distance and cause serious damage by stripping the insulators and breaking the cross wires before the car is arrested.



In a form of trolley recently patented by Walter H. Knight, of Newton, Mass., a mechanical alarm is attached to the trolley, by which, when the roller leaves the conductor and the trolley arm flies up under stress of its spring, a gong is sounded, thus notifying the driver of the fact. In the accompanying engraving the device is illustrated, D representing the gong, the hammer of which is adapted to be thrown by a toe *e* engaging a fixed rack F. When the trolley leaves the conductor the arm is thrown up. The toe *e* engaging the successive teeth of the rack causes a series of strokes on the gong.

Electric Street-Lighting in Berlin.

REPORT BY CONSUL-GENERAL EDWARDS.

The use of the electric current for public lighting purposes in the city of Berlin dates from the beginning of the period under report.

Since the Fall of 1882, the Potsdamer Platz and Leipziger street, as far as Freidrich street, have been lighted with 36 electric arc lights.

At first the business was in the hands of the firm of Siemens & Halske, but in the Spring of 1886 it was transferred to the Berlin Electricity Company.

With the exception of a few interruptions, which were excusable at the beginning of the business, nothing has occurred to raise any objection to the further use of electricity for street-lighting purposes.

It is true that there is a difference in the cost of electric and gas lights, even where improved burners, which consume a much larger quanity of gas than did the old ones, are used. Yet, when the question arose as to whether the Unter den Linden, which had previously been miserably lighted, should be lighted with electricity or with improved gas jets, the city authorities decided in favor of the former. It was decided on April 29, 1887, that

"The grand entrance of Unter den Linden, in our present imperial city, the popular promenade in the same, the monumental character of the buildings on this street and on its extension, as far as the royal castle, require the use of the most beautiful, if at the time the most expensive, system of lighting and to a greater extent than in the Leipziger street, which, however brilliant it may have become in recent times, lacks the esthetic and historic importance of the street in which our emperor and crown prince reside, of the street which time and again has been the *via triumphalis* of our returning victorious warriors."

On September 29, 1887, the project of lighting Unter den Linden and its extension as far as the Spandauer street was finally adopted, and the contract was given the Berlin Electricity Company.

On August 31, 1888, for the first time, 104 arc lights cast there dazzling brightness over the Pariser Platz, Unter den Linden, the Opera Platz, the Castle bridge, the Platz am Lustgarten, and the Kaiser Wilhelm bridge and street.

The lamp poles were constructed after a model approved by the architectural society, and cost 82,000 marks.

The amount to be paid by the city for light was fixed by contract at 36 pfennigs per hour, or 96,262.80 marks per annum. For the Potsdamer Platz and Leipziger street 40 pfennigs* per hour is paid to the Berlin Electricity Company. This amounts to about 29,000 marks per annum. The company, at its own expense, keeps in repair lamps, lanterns and poles and attends to the lamps. While these two streets are lighted with electric light, there has been an improvement in the lighting of many other streets also.

The ever-increasing traffic on the principal streets, and the extension of the network of street car lines, have rendered necessary for streets in the periphery of the city not only an increase in the number of lights, but also a great increase in their intensity as compared with that of ordinary street lamps.

To Organize an Electric Company.

Mr. James S. Humbird, who spent last week here arranging for the establishment of a manufactory of electrical appliances, left on Saturday for Pittsburgh for the purpose of organizing his company, preparatory to opening up the works in the old Gephart foundry property, on Front street. The capital stock will be $100,000. The machinery for the works is being shipped and some of it is already here.—*Cumberland, Md., Independent.*

* The difference in the unit of cost is only apparent, as the 10 per cent. tax which the company has to pay the city on its gross receipts, has, in the price for Unter den Linden, already been deducted, while it is included in the 40 pfennigs paid on Leipziger street. In reality the lighting on Unter den Linden is cheaper in that, in accordance with contract, each arc lamp has a 2,000 candle brilliancy, while those on Leipziger street have only 800 candle brilliancy.

Pocket Electrometers.

At a meeting of the British Physical Society, June 26, 1891, C. V. Boys, F. R. S., read an interesting paper on "Pocket Electrometers." This communication described modifications of electrometers adapted for portability. He had, he said, pointed out some time ago the great advantage arising from making galvanometers small. Applying similar reasoning to electrometers, he remarked that making an instrument one-tenth the size of an existing one reduced the moment of inertia of the needle to $\frac{1}{10^5}$, whilst the deflecting couple for given potentials would only be one-tenth of its former value. The small instrument would for the same periodic time be 10,000 times more sensitive than the large one, provided the disturbing influences could be reduced in the same proportions. This, however, was not ordinarily possible, for any method of making contact with the needle, such as by a fine wire dipping into acid or mercury, prevented very small controlling forces being used. Still, by suitable devices, a large proportion of the full advantage could be obtained. A freely suspended needle without liquid contacts was essential to success. The first instrument as described was one in which the needle was cylindrical, contiguous quarters being insulated and connected to the opposite ends of a minute dry pile placed within the needle; opposite quarters were thus at the same potential, and at a different potential to the other pairs of quarter cylinders. This was suspended within a glass tube inclosed on the inside and divided into four parts by five longitudinal lines. In such an instrument the needle and quadrants are reciprocal and the deflection depends on the product of the two differences of potential between the quadrants and that between the parts of the needle. Owing to the dry pile not being constant the instrument was found unreliable, but when working at its best, a Grove cell would give 30 or 40 millimetres deflection. The next step was to make a cross shaped needle of zinc and platinum, and rely on contact electricity to keep the parts of the needle at different potentials. This bold experiment proved remarkably successful, for the instrument was very sensitive. A disk shaped needle with quadrants alternately zinc and platinum was then employed, and by this a small fraction of a volt could be measured. The weight of the disk was only one-twentieth of a gramme, and the instrument could be turned upside down or carried about in the pocket with impunity. Another small instrument with the stationary quadrants of zinc and copper was exhibited, and by rotating them through an angle of 90 degrees, so as to bring them in a different position relative to the parts of the needle, a deflection of several degrees of arc was produced. In the course of his remarks Mr. Boys made several suggestions relating to ballistic electrometers and electrostatic Siemens dynamometers, and pointed out the possibility of instruments such as he had exhibited being of use in elucidating the obscure points in connection with so-called "contact electricity."

The president complimented Mr. Boys on the beautifully simple and remarkably sensitive electrometers exhibited. He remembered that some years ago Mr. Gordon, made a very small electrometer but its insulation was insufficient for electrostatic work. He agreed with Mr. Boys as to the advantages of small instruments, providing sparking across or tilting of the needle could be prevented. On the other hand, he thought the use of small potential differences on the needle was a step in the wrong direction, when great sensibility was required. Professor Perry asked if the needle could not be kept charged by occasional contacts with a charged acid cup. Mr. Boys said he had originally intended using a fairly highly charged needle but had not yet done so. He also suggested that an electrometer of very small capacity might be made by reducing the quadrants surrounding a disk needle until they became like small tuning forks.

The liabilities of Matthew H. Robinson, electrical engineer, Quincy, Mass., are $8,885. He will settle in insolvency.

Electric Power Rates.

In a very handsome pamphlet recently issued by the "C. & C." Electric Motor Company, New York, the following tables of rates are published. All the generating stations are operated by steam power, except those at Rochester, N. Y., and Des Moines, Ia., at both of which places water power is used.

NEW YORK.

	Intermittent work. per month	Freight elevators. per month
¼ horse-power	$3 00	.....
½ "	5 00	.....
¾ "	8 00	.....
½ "	12 50	$10 00
1 "	22 50	15 00
2 "	30 00	18 33
3 "	36 66	21 66
4 "	43 75	25 00
5 "	50 00	28 33
6 "	56 88	31 66
7 "	63 33	35 00
8 "	69 37	38 33
9 "	75 00	41 66
10 "	100 00	60 00
15 "	125 00	.....
20 "	145 83	.....
25 "		

Based on Maximum Readings.
Continuous Work, 50 per cent. extra.

METER RATE.

Ten cents per horse-power per hour, with discounts as follows:

	horse-power hours per month	
On bills for	100 to 200	20 per cent.
" "	200 to 400	25 "
" "	400 to 600	30 "
" "	600 to 800	35 "
" "	800 to 1,000	40 "
" "	1,000 to 1,500	45 "
" "	1,500 or over	50 "

CHICAGO, ILL.

Applicable to classes of work in which the rate of power consumption is uniform, or nearly so, such as operating ventilating fans.

	per month		per month
¼ H. P.	$5 00	7 H. P.	$65 45
½ "	8 50	8 "	73 20
1 "	14 00	9 "	81 45
2 "	25 00	10 "	90 00
5 "	50 75	15 "	135 00
6 "	57 90		

Applicable to classes of work in which the rate of power consumption is variable, such as operating machinery for printing, sewing, embossing, wood and metal working, pumping for hydraulic elevators, coffee grinding, baking, etc.

	per month		per month
⅛ H. P.	$3 00	6 H. P.	$42 60
¼ "	4 50	7 "	47 25
½ "	6 50	8 "	52 50
1 "	10 00	9 "	57 15
2 "	18 50	10 "	62 50
5 "	37 25	15 "	93 75

Based on Maximum Readings.

ELEVATOR WORK

Applicable only to elevators driven by belts direct from the motor.

	per month		per month
4 H. P.	$26 00	8 H. P.	$42 00
5 "	30 00	9 "	46 00
6 "	34 00	10 "	50 00
7 "	38 00	15 "	70 00

BOSTON, MASS.

Ten cents per horse-power per hour with discounts from monthly bills as follows:

Bills of from $5 00 to $8 00	....	20 per cent.
" " 8 00 to 13 00	...	25 "
" " 13 00 to 20 00	...	30 "
" " 20 00 to 30 00	....	40 "

The rate for 10 horse-power would be a similar scale with the following discounts:

Bills of from $30 00 to $44 00	..	20 per cent.
" " 44 00 to 60 00	..	25 "
" " 60 00 to 95 00	..	30 "
" " 95 00 upward	..	40 "

BROOKLYN, N. Y.

	Intermittent per year		per year
1 H. P.	$110 00	9 H. P.	$555 00
2 "	185 00	10 "	595 00
3 "	250 00	11 "	630 00
4 "	320 00	12 "	665 00
5 "	375 00	13 "	700 00
6 "	425 00	14 "	735 00
7 "	470 00	15 "	770 00
8 "	515 00		

Based on Maximum Readings.
Continuous Work, 50 per cent. extra.

ROCHESTER, N. Y.

⅛ H. P.	$18 00 to $36 00 per year.
½ "	5 00 per month.
1 "	7 00 "
2 "	10 00 "
5 "	25 00 "
10 "	36 00 "
15 "	50 00 "

PHILADELPHIA, PA.

Meter rate of 7½ cents per horse-power per hour for less than 1,500 horse-power hours per month. For over 1,500 horse-power per month, five cents per horse-power hour.

DETROIT, MICH.

For 1 horse-power	$10 00 per month.
" 2 "	16 00 "
" 3 "	24 00 "

and $7.50 per horse-power per month for large motors up to 10 horse-power, dropping to $60.00, and $5.00 per horse-power for larger rates.
Based on Maximum Readings.

DES MOINES, IOWA.

	Constant per month	Intermittent per month
¼ H. P.	$4 00	$3 00
½ "	5 00	3 75
1 "	8 00	6 00
2 "	14 00	10 00
3 "	20 00	14 00
4 "	25 00	17 50
5 "	30 00	20 00
7½ "	40 00	28 00
10 "	50 00	33 00
15 "	70 00	46 00
20 "	90 00	60 00
25 "	110 00	72 00

ELEVATOR WORK

	per month
3 horse-power	$12 50
5 "	18 00
7½ "	25 00
10 "	30 00
15 "	40 00

MR. CHAS. A. SCHIEREN,

OF CHAS. A. SCHIEREN & COMPANY, NEW YORK.

CINCINNATI, OHIO.

	per month 26 days		per month 26 days
⅛ H. P.	$3 25	5 H. P.	$37 05
¼ "	4 55	6 "	42 90
½ "	6 50	7 "	48 59
½ "	8 29	8 "	54 08
1 "	9 75	9 "	59 67
2 "	17 94	10 "	65 00
3 "	24 96	15 "	95 55
5 "	31 20	20 "	124 80

KANSAS CITY, MO.

	per year	per month	per H. P. per year
1 H.P.,	$120 00	$10 00	$120 00
2 "	200 00	16 66	100 00
3 "	292 50	24 38	97 50
4 "	380 00	31 66	95 00
5 "	462 00	38 50	92 50
6 "	540 00	45 00	90 00
7 "	612 00	51 00	87 50
7½ "	647 00	53 75	86 25
8 "	680 00	56 66	85 00
9 "	742 00	61 83	82 50
10 "	800 00	66 66	80 00
15 "	1,181 25	98 44	78 75
20 "	1,550 00	129 17	77 50
25 "	1,906 25	158 85	76 25
30 "	2,250 00	187 50	75 00

Based on Maximum Readings.

NEW ORLEANS, LA.

Meter rates 12 cents per horse-power hour, less discounts as follows:

5%	off on bill over	$8 00 and under	$10 00
10	" "	10 00 "	15 00
15	" "	15 00 "	20 00
20	" "	20 00 "	30 00
25	" "	30 00 "	40 00
30	" "	40 00 "	50 00
40	" "	50 00 "	75 00
50	" "	75 00	

Charge for current furnished by contract, from $8.00 to $10.00 per horse-power developed per month.

NEWSPAPER ADVERTISING.

From the Investor's Point of View.

THIRD OF A SERIES OF ARTICLES ON THIS IMPORTANT BRANCH.

Our third article in this series voices the advertising opinions of Mr. Chas. A. Schieren, of this city, who represents large and important leather belting interests.

TO THE EDITOR OF ELECTRICAL REVIEW:

Does advertising pay? My reply would be, that if you want to succeed in business you must let the public know what you manufacture or offer to sell, and there is no agency so successful as through the medium of the press. Some merchants differ on this point and claim that sending circulars and pamphlets to the trade by mail is more efficient and less expensive. Our experience has been to the contrary. We have advertised most effectively through the various trade papers. We understand the importance of selecting the journals best suited to the parties we aim to reach, and to prove how far-reaching advertising may be, we will quote a few amusing incidents from an advertisement placed in a weekly journal devoted to electricity.

One day we received an inquiry from a man in Kansas for more information of the curative qualities of our "electric belting," evidently confounding it with the much-advertised medical electric belt worn around the body. We answered him that the curative qualities of our belt consisted principally in making bad and irregular transmission of power to dynamos run perfect, and that we would guarantee astonishing results upon the first application.

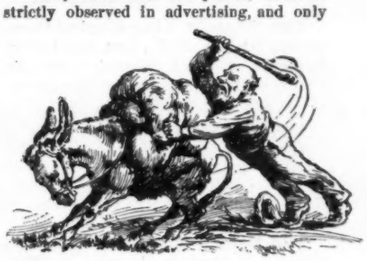
Another party, all the way from California, wanted to know if our electric belt would aid poor circulation of the blood, and stated that his boy was afflicted with it. We advised him to go to the nearest cobbler in his town and obtain a leather strap, and if well applied to his son it would make his blood fairly jump, and hinted that we gave our boyhood experience in the matter, which was still fresh in our memory.

Wood-cuts are great aids in making advertisements attractive, especially when they illustrate what you wish to publish. A clever cut will always attract attention. One of our most successful wood-cuts was a sort of play on the word "Gowanus," used on our raw-hide lacing.

However, that kind of advertising must not be overdone, and always kept within certain limits. No matter how successful a merchant may be in his advertisements, his goods must bear up what he claims for them. The public soon learns the shams of the trade, and no amount of puff will sell spurious goods and build up a trade.

Not long ago an announcement appeared in one of the journals wherein a manufacturer offered one dollar for every inch that his belt would stretch. Well! He had to pay his dollar, and dollars, and he made haste to withdraw that advertisement.

"Keep faith with the public," must be strictly observed in advertising, and only



(GO—ON—ASS!)

GOWANUS.

permanent success can be attained by adhering to that policy.

In conclusion, we cheerfully admit that millions of circulars distributed by mail would not have made our electric and perforated leather belting as popular and well known to electricians and the electric light world generally as our generous advertising in the electrical journals. Personally, my name will ever be connected with leather link belting, not only because of the simple and practical invention of the "American Joint," but largely on account of our extensive and judicious advertising of the merits of the belt, and also to the kindly comments and courtesies received from the press.

Therefore, my answer is, "Advertising does pay."

Truly yours,

Chas. A. Schieren

New York, July 14, 1891.

OBITUARY.

Mr. John O'Neill, who died in Boston on the 16th inst., after a long and painful illness, which he bore with great patience, was the late superintendent of the Louisiana Electric Light Company, New Orleans, La., and for many years assistant superintendent and engineer of the Boston Electric Light Company.

Wheeling Electric Light Commission.

A party of 15 gentlemen, forming the Electric Light Commission of Wheeling, W. Va., arrived in New York July 19, under the guidance of Mr. D. W. Dunn, of the Pittsburgh Thomson-Houston office. Mr. John A. Seely, the consulting engineer of the Commission, hospitably entertained the party at the Electric Club. Among the cities visited by the Commission were Chicago, St. Louis, Fort Wayne, Pittsburgh and Detroit. The large plants in all these cities were inspected by the party.

A Large Contract Awarded.

The contract for the electric light plant for the Masonic Temple in Chicago, which will be one of the largest isolated plants in the world, has been awarded to the Western Isolated Lighting Department of the Thomson-Houston Electric Company. The generating plant will consist of six 80,000 watt generators and between 7,000 and 8,000 lights will be wired.

This plant rivals in capacity either of the plants installed in the Auditorium building at Chicago, although the two plants together possess a larger capacity.

Competition for this contract was unusually keen, nearly every company in the field having made proposals, and the Isolated Department of the Thomson-Houston Company naturally feel elated at their success, particularly as, in addition to the generating plant and wiring, an order was secured for 8,750 Thomson-Houston incandescent lamps and the necessary sockets.

KINDRED INTERESTS

The Straight Line Engine Company, Syracuse, N. Y., have issued a very handsome catalogue descriptive and illustrative of the well-known Straight Line engines.

The Hot Weather of the past week is what electrical people call good "fan weather," and the Central Electric Company, Chicago, report large sales of motor fans. They keep a large variety of this class of goods for customers to select from.

The Brown & Sharpe Manufacturing Company, Providence, R. I., announce that their extensive plant will be closed from August 8 to 15, inclusive, for annual vacation and repairs. The office will be kept open as usual and orders will be promptly filled.

Portland, Ore.—The partnership heretofore existing under the firm name of Dayton, Hall & Avery has been dissolved by mutual consent, Victor A. Avery retiring. Frank Dayton and Robert F. Hall will continue the business under the firm name of Dayton & Hall, assuming all liabilities and collecting all claims.

J. H. Bunnell & Company, 76 Cortlandt Street, New York, inform us that the marshal served papers last week on the Manhattan Electric Supply Co., of this city, for infringing the patent of the Burnley dry battery. The Burnley dry battery people propose to protect their rights and prosecute all infringers.

The New Haven Insulated Wire Company, of New Haven, Conn., the manufacturers of the well-known Helmet brand of insulated wires, recently sold by the Empire City Electric Company, of New York, will continue to manufacture their goods, as there is a large demand for them, and will hereafter supply dealers and central stations direct. Messrs. Hague and Bean will continue in the management.

The Pond Engineering Company report encouraging business from the southwest. They are building the complete power plant for an Edison central station, at El Paso, Tex., also a complete plant at Paris, Tex., for lighting and railway service. They are also furnishing Armington & Sims engines for Texarkana, Ark., and Austin, Tex., the latter for the new capitol building—the second engine of this make now in the capitol.

Mr. Louis Walsh has associated with himself in business Mr. Charles G. Taylor, of New York. The firm of Taylor & Walsh, 100 South Fifth avenue, New York, will manufacture and sell dry and liquid batteries, Leclanche porous cups and other specialties. Mr. Walsh was formerly with the Crosby Electric Company and Alexander, Barney & Chapin. Mr. J. Hart Robertson is the electrician of the new firm, which starts off in a business-like manner that indicates a successful career.

The Western Isolated Lighting Department of the Thomson-Houston Electric Company reports the following sales: Dernberg, Glick & Homer, Chicago, a 14,000 watt incandescent dynamo, a one horse-power motor and a fan motor; E. Rothchilds & Bros., one 17,500 watt 10 ampere arc light dynamo; Wakefield Rattan Company, Chicago, one 400 light incandescent dynamo; The University of Illinois, Champaign, Ill., one 18,000 watt alternating current dynamo and appurtenances for use in the electrical laboratory.

Asbestos Manufacturers Combine.

The H. W. Johns Manufacturing Company is the title of a new corporation formed by the consolidation of the H. W. Johns Manufacturing Company and the Chalmers-Spence Company, New York; the Asbestos Packing Company and Chas. W. Trainor & Company, Boston; and the Shields & Brown Company, Chicago. These were the largest manufacturers of asbestos products in the United States. The new company will control the greater part of the asbestos trade in this country.

The officers of the new company are H. W. Johns, president; R. H. Martin, vice-president; C. H. Patrick, treasurer, and G. P. Erhard, secretary. The company expects to reduce manufacturing expenses and to be able to give its customers the accruing advantages.

World's Fair Notes.

Twenty-four foreign nations have now officially accepted the invitation to participate in the Exposition. Russia, Turkey, Denmark, Persia and Egypt are among the recent acquisitions.

Thus far an aggregate of $2,695,000 has been appropriated by 29 States for representation at the World's Fair.

It is probable that the cost of the Illinois State building will be reduced from the original estimate of $400,000 to $250,000, by the use of staff instead of stone. Architect W. W Boyington has recommended this change, owing to the reduction of the State appropriation from $1,000,000 to $800,000. Otherwise the plans of the structure will have to be modified and a less imposing building be constructed.

FOR SALE.

One 120 horse-power Rice Automatic Engine, in first-class order; in use about one year.

CITIZENS' ELECTRIC LIGHT COMPANY, COSHEN, IND.

THE LAW

Double Cylinder Battery.

Surface of negative element and quantity of solution double that found in any other open circuit cell.

Weigh carefully these advantages.

Its sale has steadily increased for ten years.

LAW TELEPHONE CO.,

Sole Makers,

87 JOHN STREET, NEW YORK.

MACHINERY IN STOCK.

Engine Lathes, 10 in. x 4 ft.; 11 in. x 5 ft.; 13 in. x 6 ft.; 14 in. x 6 ft.; 16 in. x 6 ft.; 18 in. x 8 ft.; 20 in. x 8 ft., with tapes attachment; 22 in. x 12 ft. and 14 ft.; 24 in. and 26 in. x 16 ft.; 30 in. x 10 ft. and 18 ft.; 36 in. and 38 in. x 20 ft.; 42 in. x 12 ft.; 56 in. x 18 ft.; 72 in. x 20 ft.; 108 in. x 22 ft. Fox Lathes, 13 in. x 5 ft.; 14 in. x 5 ft.; 15 in. x 6 ft.; 18 in. x 6 ft. Turret Lathes, 12 in. x 5 ft.; 14 in. x 5 ft.; 15 in. and 16 in. x 6 ft.; 18 in. x 6 ft.; 36 in. x 8 ft.

Planers, 16 in. x 16 in. x 3 ft.; 20 in. x 20 in. x 4 ft.; 24 in. x 24 in. x 6 ft.; 30 in. x 30 in. x 6 ft.; 36 in. x 36 in. x 10 ft.; 42 in. x 42 in. x 12 ft.; 72 in. x 60 in. x 15 ft.; 72 in. x 60 in. x 20 ft.

Friction Shapers, 15 in., 16 in., 20 in., 22 in., 32 in.

Crank Shapers, 6 in., 8 in., 10 in., 12 in., 15 in., 16 in., 20 in., 24 in., 28 in.

Screw Machines, Nos. 1, 2, 3, 4, with or without Wire Feed.

Screw Machines, Nos. 5, 6, 7, 8, Power Feed.

Presses, Nos. 51, 52, 53, Ferracute, Nos. 1, 2, 3, Stiles & Parker.

20 Lincoln Pattern Millers, No. 2.

Hand Millers, Nos. 1 and 2. 3 Cam Cutters.

Bolt Cutters, ¼ in. to 1 in., ½ in. to 2 in.

2 Profiling Machines. 1 36 in. and 48 in. Gear Cutter.

1 New Horizontal Boring Machine. Newark Machine Tool Co.

Send for List of New and Second-Hand Machinery in Stock.

PRENTISS TOOL & SUPPLY CO., P. O. Box 3362.

115 Liberty Street, New York.

THE REMINGTON STANDARD TYPEWRITER

Is to-day, as it has ever been, the leading Typewriter. Carefully tested improvements are constantly added to this famous machine.

Send for Illustrated Catalogue.

Try Our Paragon Brand of Typewriter Ribbons.

Wyckoff, Seamans & Benedict.

327 Broadway, New York.

PATENT PERFORATED ELECTRIC LEATHER BELTING

MANUFACTURED BY

Charles A. Schieren & Co.,

45, 47, 49, 51 FERRY ST.,

COR. CLIFF ST.

BRANCHES:

BOSTON, 119 HIGH STREET.

PHILADELPHIA, 226 NORTH 3d STREET.

CHICAGO, 46 SOUTH CANAL STREET.

(Patent Applied For.)

"A BIG HIT!"

AN ADJUSTABLE HAMMER

WE CLAIM this is the Best, Cheapest, Loudest Ringing and Handsomest Electric Bell in the United States.

WRITE FOR PRICES.

HAY-HORN MFG. CO.,

63 South Canal Street,

NEW CATALOGUE READY. CHICAGO.

Eastern Agt., Jas. E. Mason, 130 Park Ave., B'klyn, N. Y.

JEWELS for scientific purposes. Sapphire and Agate Galvanometer Jewels. Sapphire Dies and Cutters for Fibres.

JOHN WENNSTROM,

COR. JOHN AND DUTCH STREETS, NEW YORK.

IF YOU have anything pertaining to electric machinery you want to sell, send us the description.

IF YOU want anything pertaining to electric machinery, send us your inquiries.

FRANK RIDLON & CO.,

Dealers in New and Second-Hand

Electric Light & Power Machinery,

196 SUMMER STREET, BOSTON.

THE ELECTRICAL ENGINEERING COMPANY,

Contractors for Complete Arc, Incandescent and Power Plants.

ROOM 603, MONON BLOCK, 320 DEARBORN ST., CHICAGO, ILL.

Superintending Electrical Construction, and Advice on Electrical and Mechanical Subjects a Specialty.

"Magnetic Vane" Ammeters and Voltmeters.

THE best and cheapest instruments for Central Stations, Isolated Plants, Marine Installations and Electric Railways. Special Contracts made with Manufacturing Companies for supplying Ammeters and Voltmeters for use with their plants.

Correspondence Solicited.

Send for Descriptive Circular 235, and Catalogue I-66.

QUEEN & CO., Makers, Philadelphia.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON JULY 21, 1891.

456,110 Automatic circuit closer for telegraph keys; James W. Brown, Van Wert, O., assignor of one-half to Augustus L. Sweet, Henry W. Blachy and John M. Tyron, all of same place.

456,120 Insulated electric conductor; Edwin D. McCracken, Alpine, N. J.

456,172 Method of measuring electric currents; Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.

456,182 Electric lock; Abraham S. Wiley, Detroit, Mich.

456,219 Electro-therapeutic apparatus; Edgar Granert, New York, N. Y., assignor to Emil Gramm, same place.

456,250 Insulated contact for electric switches; Ocron S. Platt, Bridgeport, Conn.

456,252 Connector and support for trolley wires; Sidney H. Short, Cleveland, O., assignor to the Short Electric Railway Co., same place.

456,253 Operating mechanism for current regulators. 456,254 Switch for electric car motors; Sidney H. Short, Cleveland, O.

456,271 Flexible conduit for electric conductors; Charles H. Herrick, Winchester, assignor of two-thirds to Herbert H. Brooks, Cambridge, and Alfred A. Brooks, Boston, Mass.

456,280 Rheostat; John Van Vleck, New York, N. Y., assignor to Luther Stieringer, same place.

456,301 Phonograph doll. 456,302 Phonograph; Thomas A. Edison, Llewellyn Park, N. J.

456,325 Secondary electric clock movement; Benedikt Haberthür, Breitenbach, Switzerland, assignor of one-half to Pius Saner, same place.

456,327 Cut-out for electric lamps; Walter F. Smith, Philadelphia, Pa., assignor to the United Gas Improvement Co., same place.

456,376 Conduit for electric cables; Maurice Delafor, Paris, France, assignor to Jacob Fréres & Co., same place.

456,498 Double contact switch; Thos. H. Lovell, Cleveland, O.

456,507 Magnetic separator; Henry G. Fiske, New York, N. Y., assignor to John D. Cheever, same place.

456,513 456,514 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Electric Car Co. of America, same place.

456,540 Method of welding by electricity; John H. Bassler, Myerstown, Pa.

456,541 Method of and apparatus for electric welding; S. Lloyd Wiegand, Philadelphia, Pa.

BURT & TOBEY WIRE COUPLING

NOW READY.

For Prices and Samples, ADDRESS,

R. I. Telephone & Electric Co.,

PROVIDENCE, R. I.

Burnley Dry Battery

PATENTED JAN., 1890.

STRONGER than any Open Circuit Battery on the Market. BETTER than any other Dry Battery yet produced. Most compact in size and cheapest. 90 cents per cell. Discount to the Trade and in quantities.

J. H. BUNNELL & CO.,

Sole Manufacturers and General Agents,

76 CORTLANDT ST., N. Y.